ARCHITECTURE DEPARTMENT CHINESE UNIVERSITY OF HONG KONG

MASTER OF ARCHITECTURE PROGRAMME 2002-2003 DESIGN REPORT

GENETIC MODIFIED ORGANISM (GMO) - LOGISTICS COMPLEX IN THE KWAI CHUNG CONTAINER TERMINAL

TSANG Siu Hing, Bon May 2003

Part I

Initial Concept

Introduction

In 1866, Gregor Mendel published the results of his investigations of the inheritance of "factors" in pea plants. By underlying the hybridization of life-forms, the biological and mathematical foundation of cross-breeding process was established. It proved that cross-breeding of animal or plant is possible to generate new species with greater hardiness and growing capacity. It marked the beginning of Genetics. Genetics was further developed when chromosome was discovered in 1879. Every organism has particular number of chromosomes within their cells. In term of human cell, there are 23 pairs of chromosomes that contained specific gene in unique location. Gene is the part that distinct our characteristics such as skin color, appearance, etc. By logically changing the gene of particular species, the characteristics of its next generation could be altered.

During these decades, genetic technology is widely developed and applied in many fields especially crop improvement. By means of genetic-modifications, genes of specific species can be improved. In 1994, Super tomato started to be sold in the American market. The genetic modification techniques allow specific genes from other crops to be applied to tomato. It resulted in a new generation with longer preserve durability. Nowadays, 60% of the products sold in supermarket contain GMO ingredients.

In the animal world, the hybridization of horse and donkey result the mule, the cross-breeding between male tiger and female lion lead to the tigon.

For instance, the movie topics also reflect the concept of hybridization. A college student was infected by the spider DNA that finally result the super hero Spiderman. While in another American film, the actor's body was combined with that of a fly, a monster was appeared with both human and fly characteristics. Its sequel was focused on the actor's son, heredity his father gene, tried hard to destroy the fly gene in his body.

Not only crops and animals, human can also be modified by genetic technology. Research is now carrying on how to "duplicate human". It is claimed that great medical value is involved as curing method of certain disease can be sorted out and useful human organs can be produced for transplant operation.

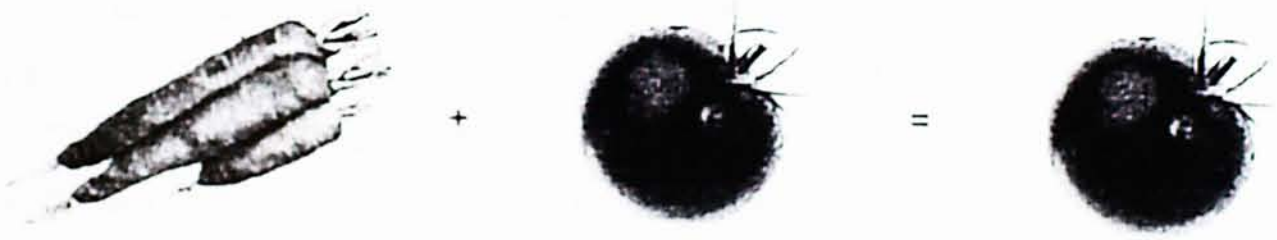
As hybridization is such a widely- spread concept in our world, can it be applicable in Architecture?

We should notice that genetic modified organism can take many forms, while the scientists aimed at produce them with mainly 3 outcomes:

1st outcome: carrot + tomato = tomato
2nd outcome: horse + donkey = mule
3rd outcome: broccoli + cauliflower = brocoflower

In the first case, DNA from carrot is infected into tomato so as to change its quality; there is no transformation of the product outlook. For the 2nd one, it involved a totally transformation of form while mule keeps both the characteristics of horse and donkey. Brocoflower is the hybrid of broccoli and cauliflower which is light-green in color with different texture; clearly, it involves both form transformation and quality change

Genetic modification would lead to either change in quality or transform in form, or both.



Discovery from DNA

Cell is the individual unit that built up every organism. The cellular tissue is so fine that it contains the elements such as protein, cell core, cell skin and chromosomes. For human cell, there are 23 pairs of chromosomes which contain 46 DNA chains. The human reproduction cell has 23 chromosomes. When spermatozoa and ovum combine together, they form cell with 23 pairs of chromosomes. New life is then reproduced inside uterus. The 23rd pair of chromosome decides our sex which is so called sexual chromosome. The 23rd chromosome of female is model XX, written as 46. For that of male is model XY, also written as 46.

"龍生龍, 鳳生鳳"

"You are what your parents are."

It is clear that our body is 100% hereditary from parents. However, why we are different in outlook from your brothers or sisters? Biologically, 99.9% DNA is the same to all human. The only variable is that 0.1% which leads to different characteristics and appearance.

DNA is such as essential element that controls our gender, appearance and disposition. Scientists can usually find sport DNA and endurance DNA in athletics' bodies, it is a common proof to show that why they are with better physical performance by born. Sport DNA, endurance DNA can be seen as DNA that bring positive impact to our bodies, is there any "bad" DNA? The answer is yes. On the 3rd chromosome, DNA of lung cancer, throat cancer and ovaries cancer are found. Disease is also hereditary.

For instance, not all DNA exercise its power in our body. Some or them are being closed or locked unless they are stimulated by the other external elements. If one's family race have a certain number of members with good sport performance, he/she has a high potential to heredity the sport DNA. At the same time, he/she need to take regular exercise to "unlock" the sports DNA, otherwise, it would not exercise its power and remain closed in the body.

In short, DNA has some characteristics as follows:

1. 99.9% DNA is the same to all human. The only variable is that 0.1%.

2. DNA can be opened or closed, depended on the stimulation by external factors.

3. The function of DNA can be identified, substituted by other organism's DNA with same factor.

Part II

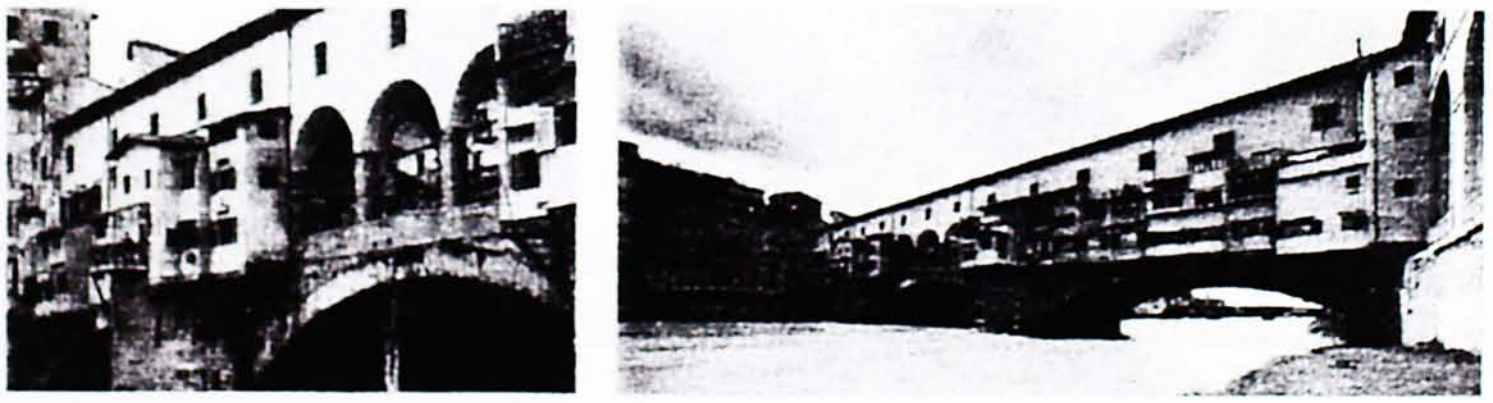
What is Architectural Hybrid?

Hybrid Architecture

Architecture, with the power of growth, adaptation and variation, can be viewed as an organism. Every individual building element, the architectural gene, can be modified to cope with specific requirement. Based on the genetic modification, the architectural genes of an architectural piece can be modified by applying the genes of another type of architecture.

Hybrid architecture is a coherent balance between form, function, technology, urban context and society. Indeed, it persist a long history in human society. Due to the Industrial Revolution, cities and towns grew rapidly with dramatically increase in population. People were unwilling to move outward from the city core. It led to the development of **hybrid buildings which combine multiple functions within a single structure. The hybrid type was a direct response to the metropolitan pressure of land value and urban grid constraints. As a result, it was totally different to multiple functional buildings in term of form and scale.**

According to the book *Hybrid Buildings* by Mr. Joseph Fenton, there are mainly 3 types of hybrid architecture which are: **Fabric Hybrid, Graft Hybrid and Monolith Hybrid**. Due to advance in computer and construction technology, buildings can be constructed in a free form just as a piece of clay that the fourth type of hybrid, i.e. **Free Form Hybrid**.



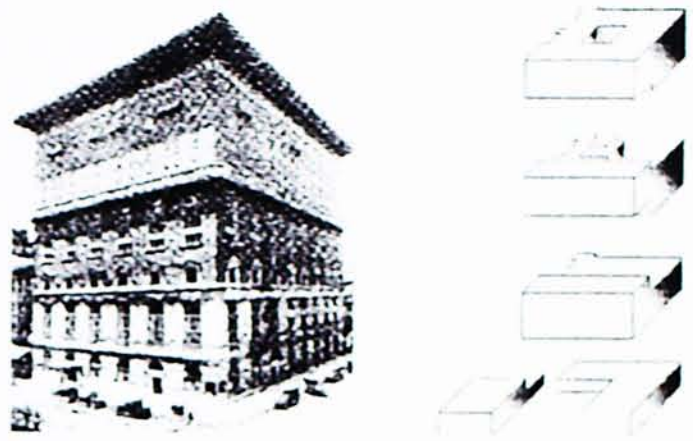
Ponte Vecchio, Florence, 1345 (Program: Apartments, stores, bridge)

1. Fabric Hybrid

Fabric hybrid is characterized by its consistent envelope that enclosed the architectural piece. Generally speaking, it is rare to determine the kinds of functional programs involved inside the building from its appearance.

e.g. Missouri Athletic Club, 1916

Program: Bank, restaurant, athletic club, bedrooms

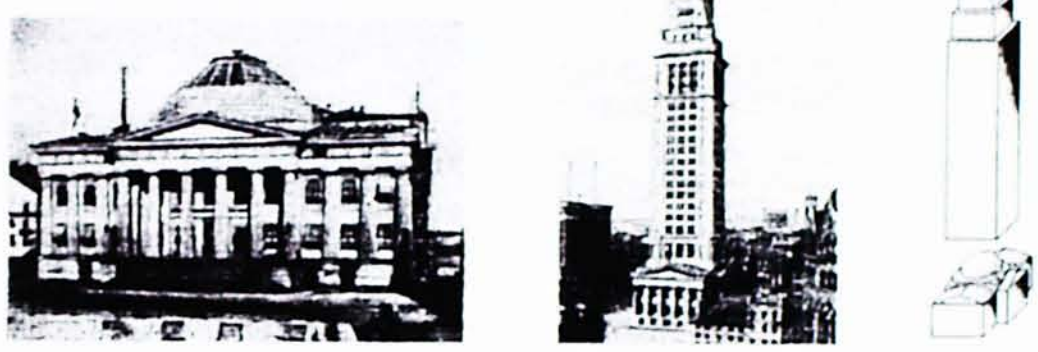


2. Graft Hybrid

Graft hybrid is identified by its expression of program. It is usually formed by the grafting of a simple building type to another.

e.g. United States Custom House, 1915

Program: custom house, offices

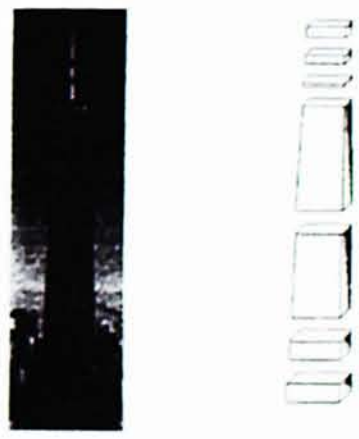


3. Monolith Hybrid

Monolith Hybrid persisted it impact due to its monumental scale on the spirit of the city is substantial. It had certain symbol meaning to the city that supercedes its functional program.

e.g. John Hancock Center, 1968

Program: Stores, parking, offices, apartments, health club, observatory, restaurant and television studio

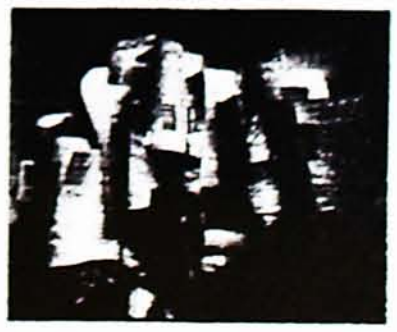


4. Free Form Hybrid

Free Form Hybrid is inherently product of computer 3D generation and the advance of construction and materials. It is characterized by its free form outlook and use of hi-tech construction materials.

e.g. Weisman Art Museum, 1993

Program: gallery space, auditorium, museum store, storage areas, carpentry and technical areas, office, meeting/class rooms and hospitality spaces



Hybrid in Hong Kong

"Hong Kong, the Alternative Metropolis, which consists of aggressively mixing up the functions, of not rigidly separating public and private, commercial and residential space. The result, it is argued, is heterogeneity, vitality, complexity. The tendency then is not toward specialization and separation, but toward the multiplication and concentration of different functions in the same space."
Ackbar Abbas
(from his *Hong Kong Culture and the Politics of Disappearance p.88-89*, 1997)

As Mr. Ackbar Abbas discussed above, HK is an "alternative metropolis" that involves aggressively mixing up of functions. It is the best place for hybrid architecture to exercise its functions.

Basically, we can still find the 3 types of hybrids in HK. The Cheung Gong Center(長江中心) is a typical example of fabric hybrid. The Pacific Places, with a clear separation between the underground MTR station, the podium shopping malls and the upper office towers, is easily identified as graft hybrid. While for the monolith hybrid, to certain extent, the HK and Shanghai Bank Headquarter Building by architect Mr. Norman Foster is one of the candidates.

However, it is critical that such kind of hybrid classification did suit for HK architecture. Indeed, their existences are a **result of globalization**. It is cleared that those kinds of buildings cannot describe the unique nature of HK hybrid. In my point of view, once of them even do not exist, that is the monolith hybrid. Monolith hybrid is, other than its internally multiple functional programs, a building as a whole that represent the city identity. It should be last for long time as it is a city landmark and receive respect from general public. In a deep thought, is such building did exist in HK? Taken the HK and Shanghai Bank Headquarter Building as an example, it is the most famous HK building that best known to the world. Track back the history; it is already the fourth headquarter building of HSBC in the same location. To the speculators, the building only worth exist if it generate enough income. It is not surprised that the building will also be toll down after 50 years, or most 80 years as it cannot catch with the refreshing image of the banking corporation. Again, as what Mr. Abbas said, HK is a city of heterogeneity, vitality and complexity. It is rather difficult to diverse a simply classification of HK hybrid. So, **it is suggested that taking a district as a base for researching different kinds of hybrid in our society.**

Historical Background of Tsuen Wan

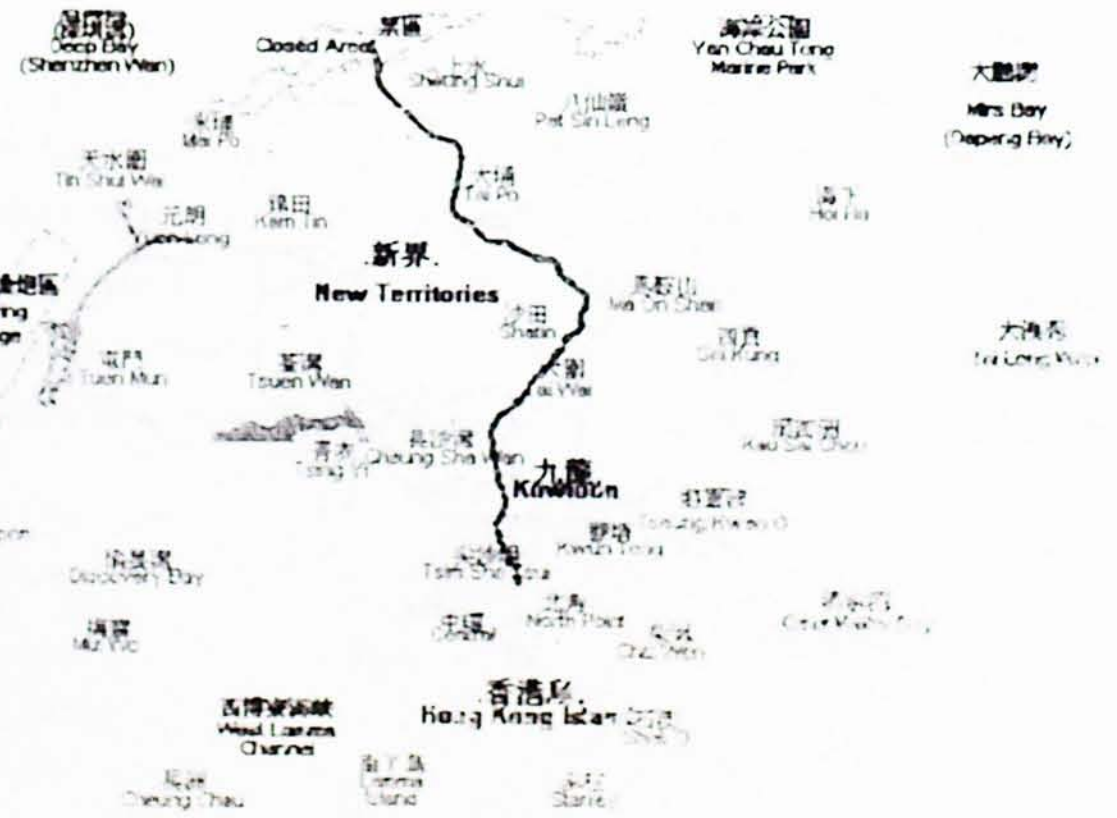
I would like to take Tsuen Wan(荃灣), the district that growing up with me in the past 20years, as the studying district.

Tsuen Wan was a small sea bay with history starting v. early from the Qing Dynasty (清朝, 1669). Before the Second War World, the habitants were mostly farmers and fishers, in addition with a number of people producing processed food such as bean curd, soy sauce, dried fruit, etc.

Till 1930s, economic activities was booming which led to grow a huge number of industrial factories with in the district. The industrial owners even grouped themselves to form the Tsuen Wan Commercial Society (荃灣商會) to fight for their economic interests.

By 1960s, there were a flux of Chinese immigrants to HK, nearly one fifth of the total HK working population were lived in Tsuen Wan as they could easily found job in the area with wide various of choices such as cotton, garment, plastic making, metal and electric.

Until early 1970s, Government aimed at developing Tsuen Wan into a new satellite town that self-sufficiency could be maintained within the community. Nowadays, it becomes a major transportation pivot that connects Kowloon Peninsula and satellite towns in the New Territories.



Alternative forms of Hybrid

HK hybrid is a production of the concentrated density, high mobility, advance in telecommunication and the mixture of old and new.

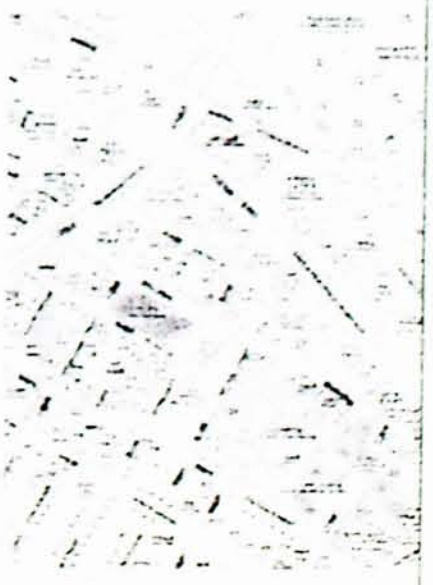
Firstly, HK population increases rapidly during these two decades to over 7 millions. It is not naturally increase by birth but is a result of immigrant influx from China. They are mostly belonged to low increase group that cannot afford high rental price in the city centre. They find their place of live and working in the new towns such as Tsuen Wan where the living expense is relatively lower. As a result, people are then squeezed in this developing town which housing capacity is further belong than the market demand. Limit in space, however, become the main reason of building transformation. 2/F of residential units is tried into salon, photo studio, clinic or even restaurant. On the other hand, building size is restricted by city grid, extension is impossible, illegal structures on the roof top, and window terrace then appeared. Leading to the transformation of a simply residential block into a complex hybrid.

Secondly, HK is a city with good system of transport network. Tsuen Wan, as the pivot between New Territories and Kowloon, the mobility of people is relatively high. While advance in telecommunication is a good mean for people to locate exactly their destination, it can ensures that the routes they chosen are the most effective and efficiency one. The speed of mobility is further enhanced. Flux of people keeps on moving in and out from Tsuen Wan MTR station as well as the nearby bus terminals. Individual building blocks are connected by bridges to facilitate people movement. Building itself lost individual identity and merged together to form connective hybrid.

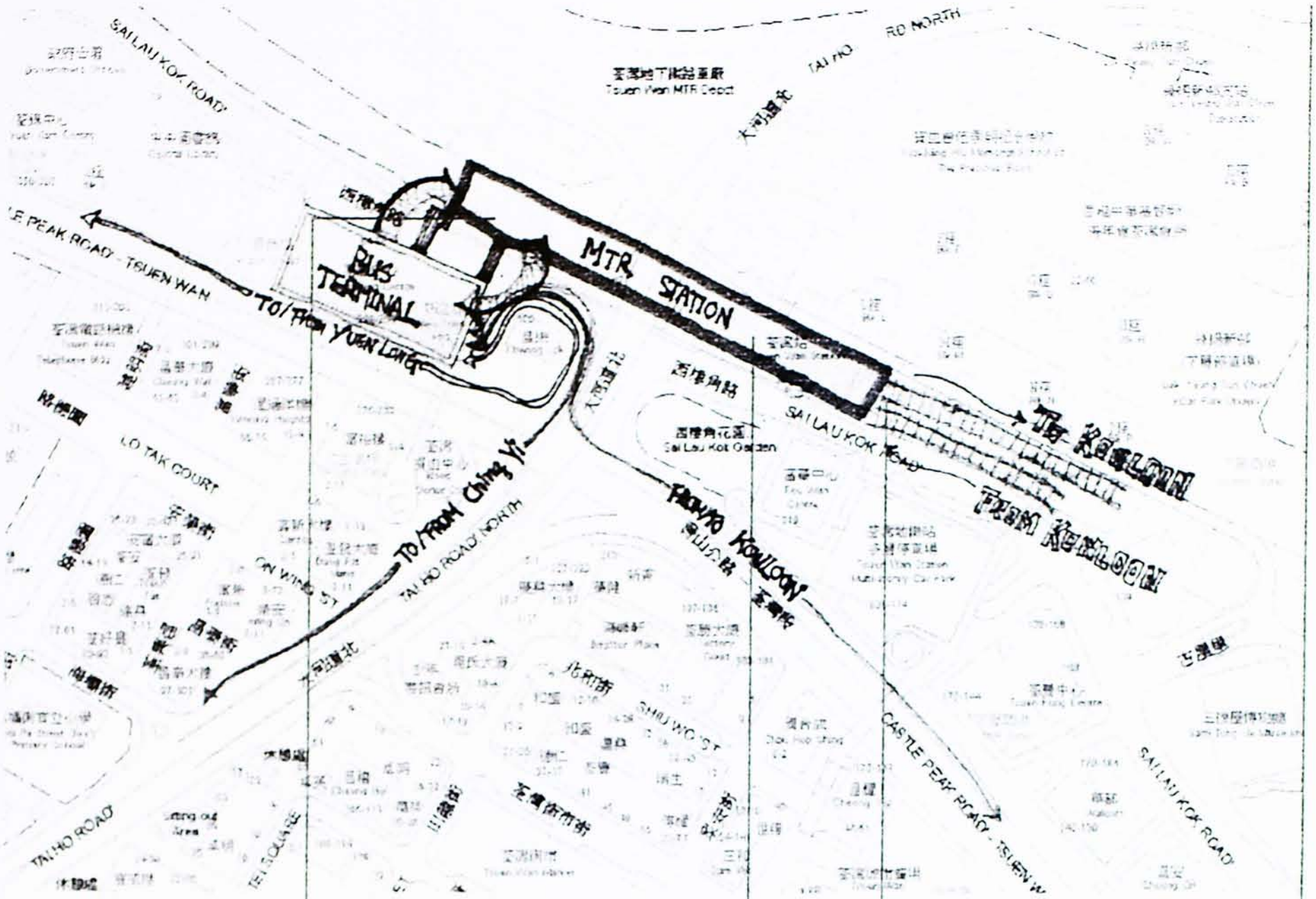
Lastly, the mixing up of old and new is another critical reason to create unique hybrid. The satellite town, Tsuen Wan, was not designed to hold such a grant population. In order to tackle the problem, the government removed the old Tsuen Wan food market and urban slums along Chung On Street(眾安街) in the early 1990s. A commercial complex and a public park then occupied the space so to fulfill the communal needs. While on the opposite side of this giant and advance buildings are some low-rise residential blocks over 50 years. The co-existence between the old and new is then contrastive. They are separated in identity, ironically, mutual support each other. The new depend on the old for its already developed communal facilitates, on the other hand, the old depends on the new for its effective outward connection. Although they don't get any physical connection, they should be viewed, as a whole, a communal hybrid that merged by people.

Conjunctive Hybrid

Connective Hybrid



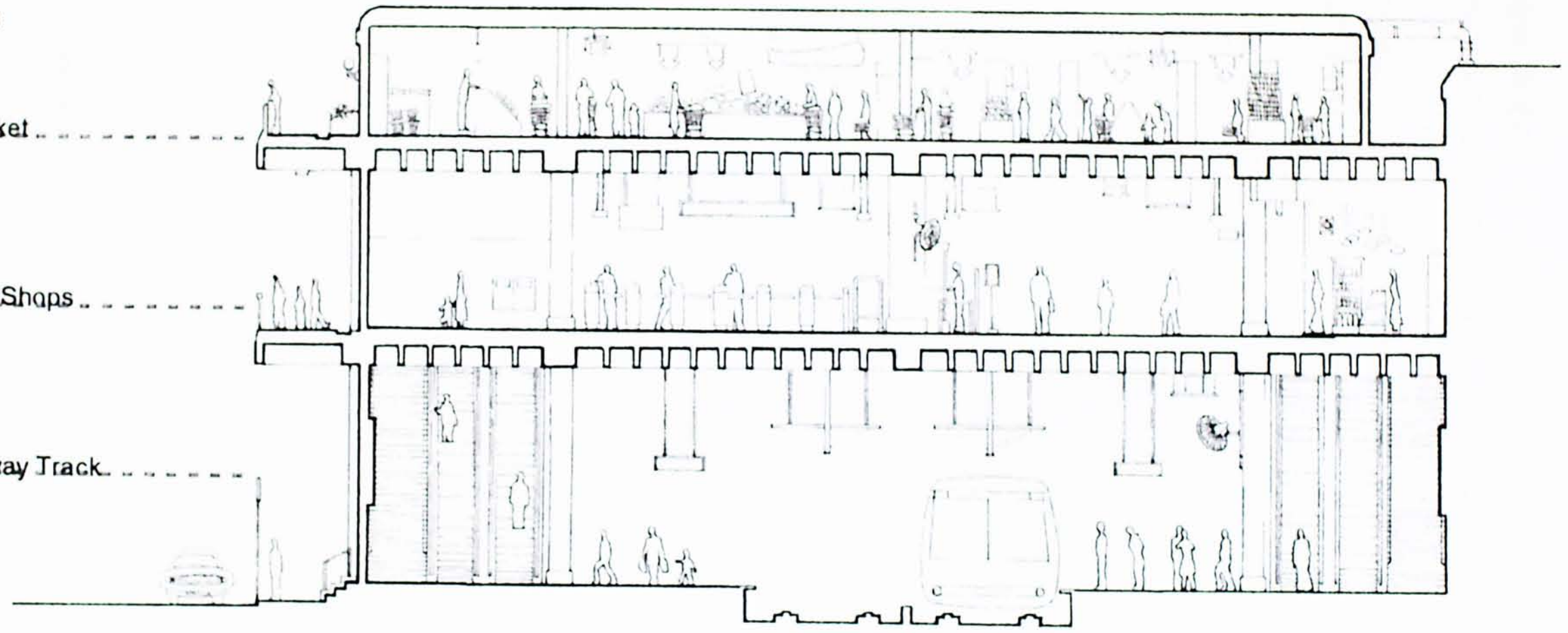
Communal Hybrid



1. Conjunctive hybrid

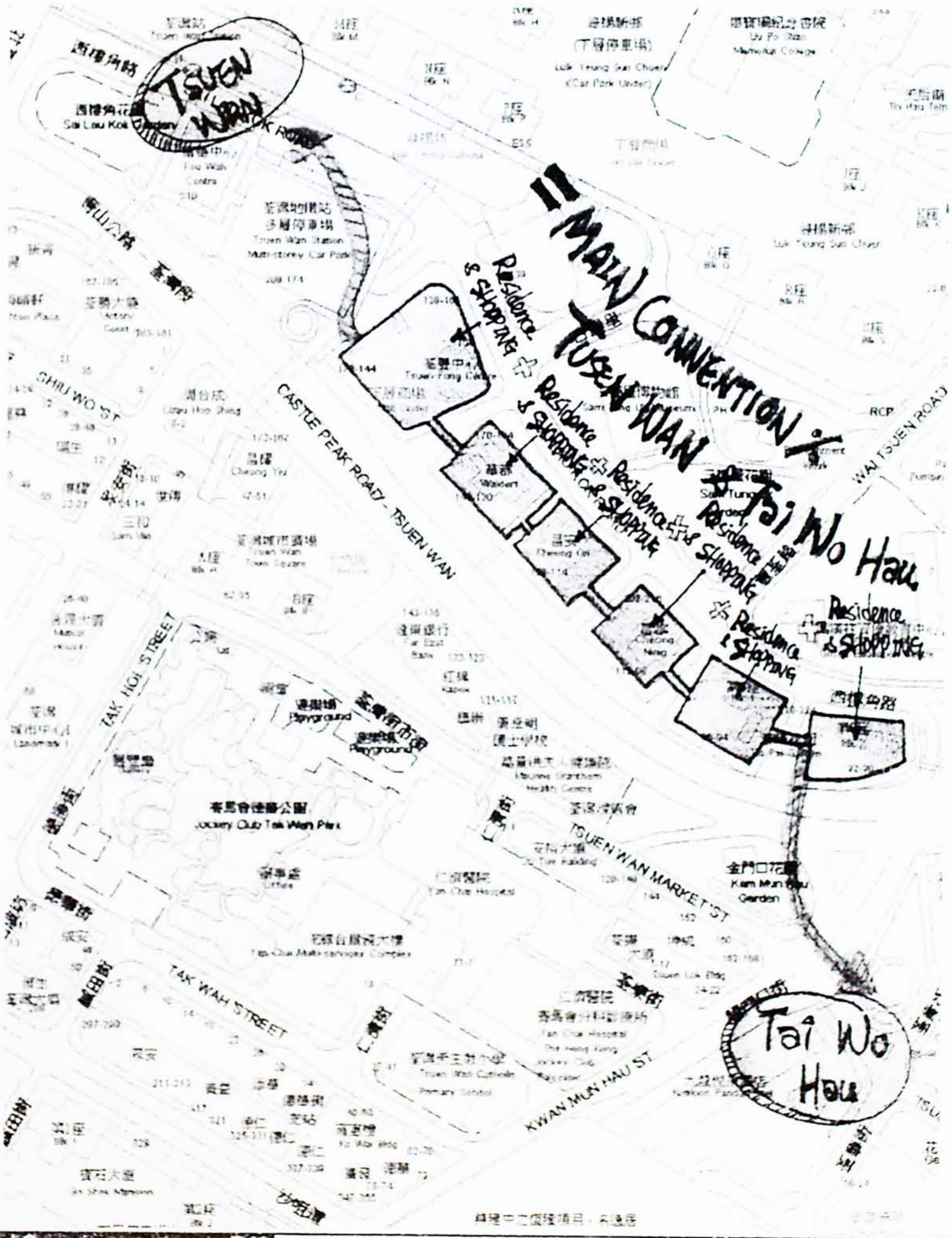
Tsuen Wan MTR Station and its nearby bus terminal under the Naam Fung Centre(南豐中心) is conjunctive hybrid. The station is connected to the surroundings, i.e. the Luk Yeung Galleria (綠楊坊), Fou Wan Centre (富華中心), Naam Fung Centre (南豐中心) and Discovery Park Shopping Centre (愉景新城). On the roof is a supermarket in addition a staircase connected to a highway. People from different direction enter in or exit the building complex, the flux of movement would never by static. It is a place of conjunction where people wouldn't start or just very short time.

Tsuen Wan MTR Station Section

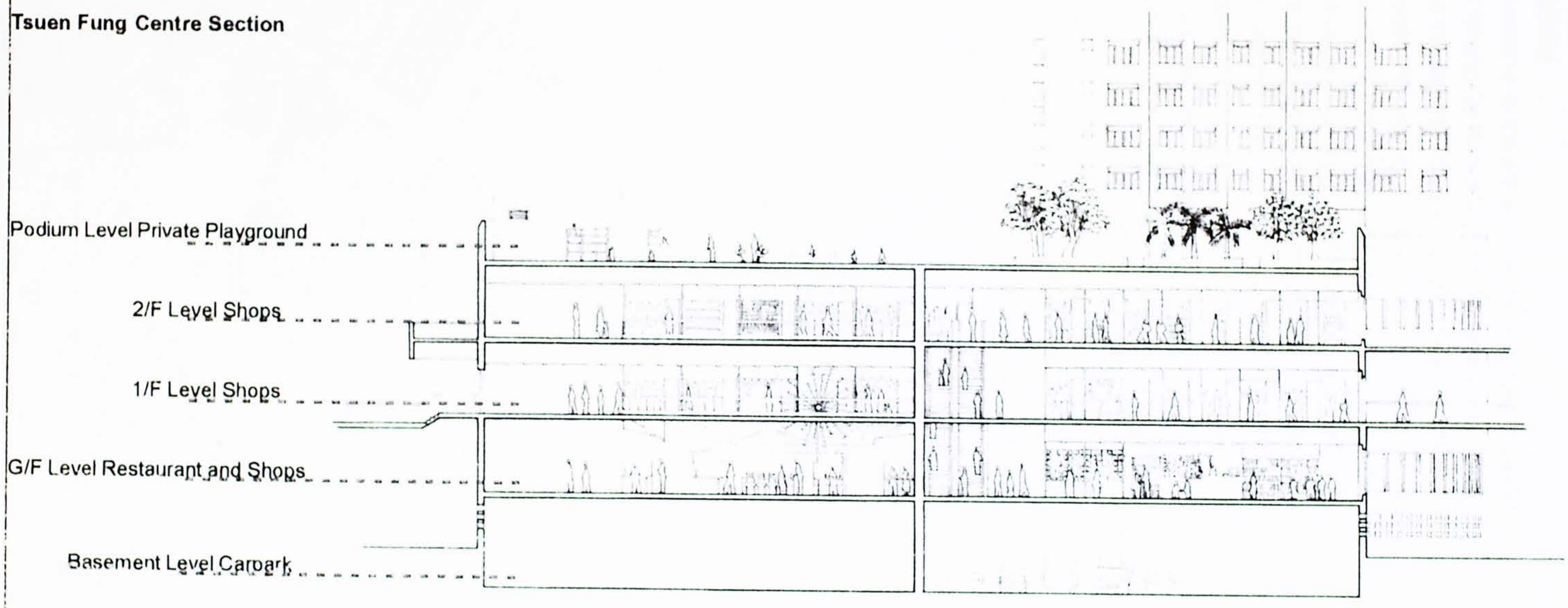


2. Connective hybrid

A series of residential and commercial buildings, starting from the Tsuen Fung Centre(荃豐中心) and end up with the Panda Hotel(熊貓酒店), is connected by pedestrian bridges. The connection between buildings was planned rather than insert into it. On the podium level, it is a series of connected shopping malls, while upon the podium is the private gardens and swimming pools for the residents. The movement happened in this hybrid is both static and two-flow.

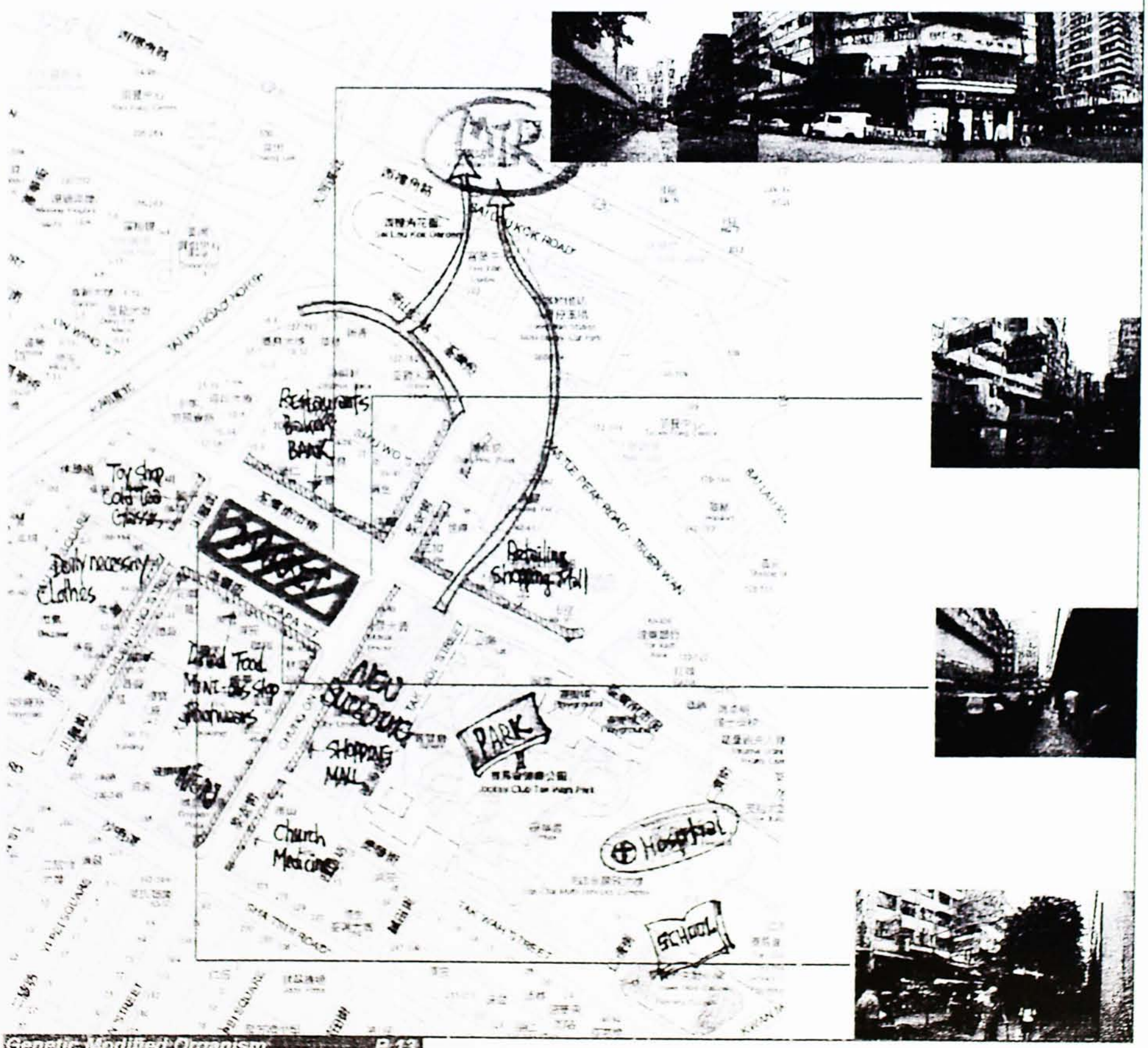


Tsuen Fung Centre Section

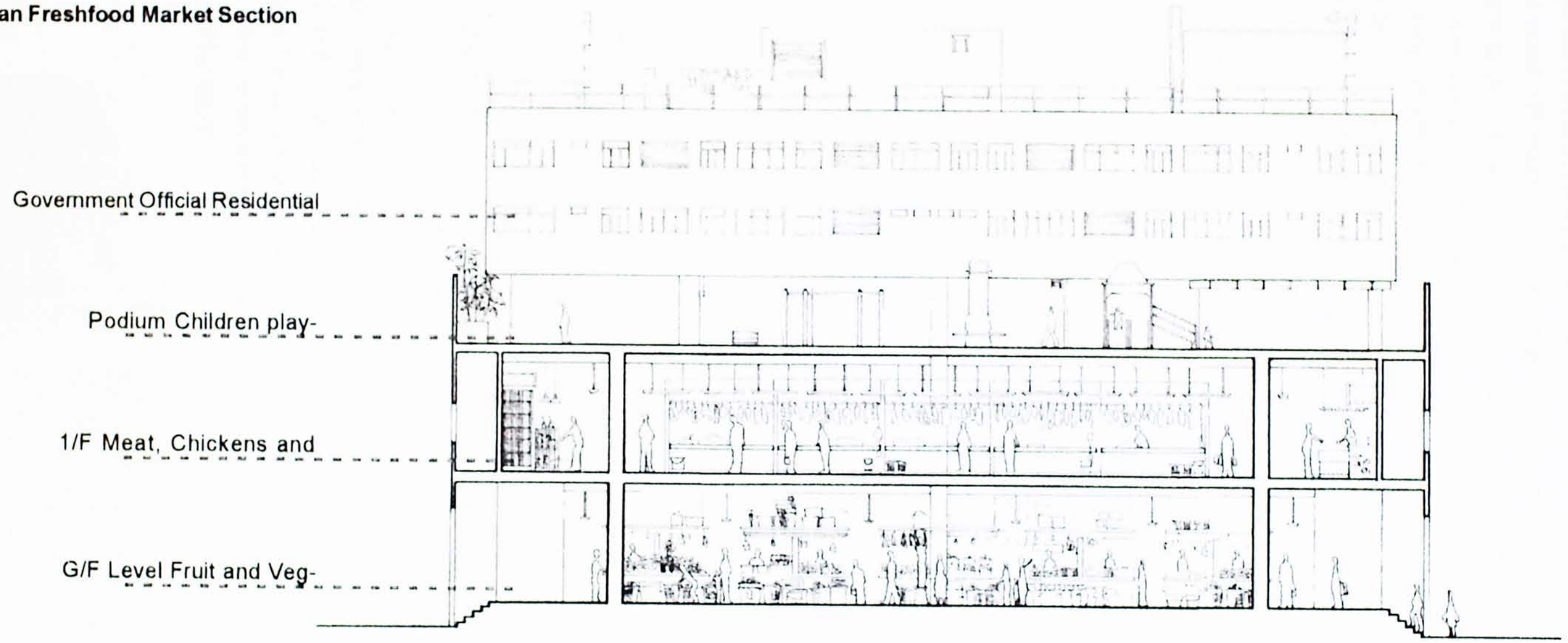


3. Communal hybrid

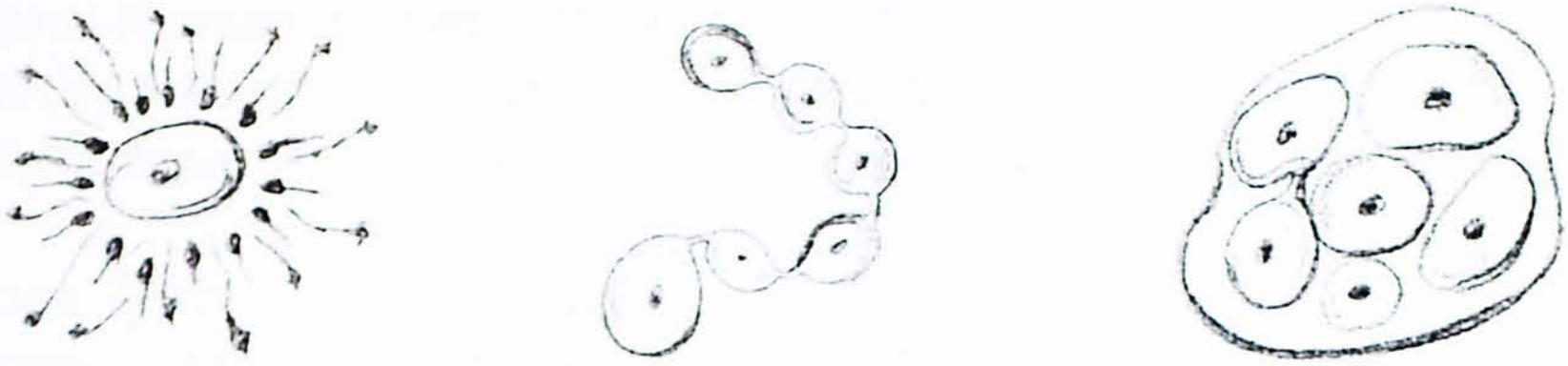
Communal hybrid occurred in the are around the 3-storeys Tsuen Wan Fresh Food Market(荃灣街市) by the side of Chung On Street(眾安街). The market is surrounded by 3 sides of low-rise residential block and the high-rise New Tsuen Wan Town Square(荃灣新城市廣場). The buildings are not physical bounded to each other; however, they are functionally connected. The New Tsuen Wan Town Square is a commercial building contains offices, gym, medical clinics and shopping mall which is connected to the MTR station. It is the most effective channel for residents nearby to go to transport centre. For the old building blocks, most of them are not purely residences anymore. Indeed, many units are tried into different function to capture high income return. By walking along the Market Street(街市街), Chuen Lung Street(川龍街) and Hoi Pa Street(海壩街), you can see hot food stores, sea food stores, bakeries, seasoning store, grocery, toy shop, glasses shop, jewellery shop, etc are crowded on the street level. While on the upper level, salons, clinics, photo studio, restaurants, fast food shop and even detective company can be found. The grids area around the Tsuen Wan Market, are no longer just a piece of residential and commercial area, they are grouped together to form a new cluster that support the daily living activities for most of the Tsuen Wan residents. While the movement pattern is really drastic and periodic.



Tsuen Wan Freshfood Market Section



Alternative hybrid in HK is not purely taken the form of fabric hybrid or graft hybrid. It involved certain variation, in usual, HK hybrid is a result of a cluster of buildings. It may due to the reason of the scarcity of land as well as way of city development. In compare with America, the population in HK is much more concentrated and the availability of land is very limited. While the city is developed fragmentary, construction is usually taken on small piece of land, huge building is somehow impossible. It leads to the development of connective bridge, i.e. they joint a ring of buildings, enhancing share of functions in between.



If different architectural units can be viewed as cells, their pattern are shown in the above conceptual drawings.

Hybrid in form of 3rd Outcome

The examples are:

Earth House in Fujian, China.

Program: defense wall, residence, pigsty.

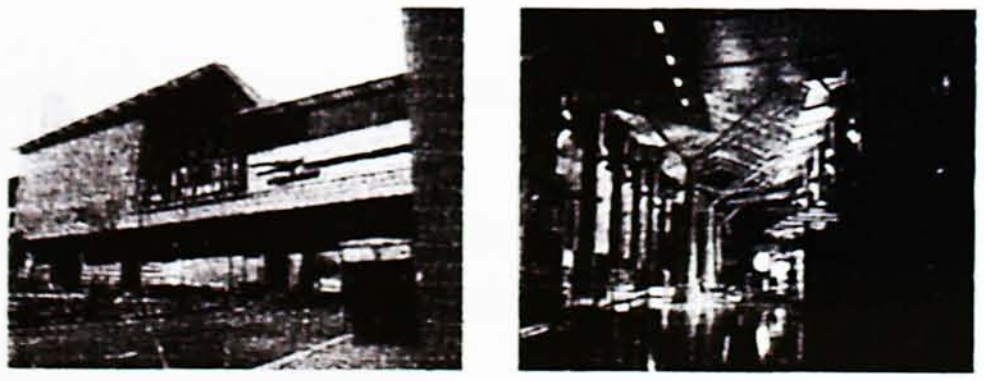
The building is a combination of defense wall and residence. Long time before, the villagers wanted to protect their lives and properties against bandits, they thought of constructing such kind of building that encircled all their belongings. The defense wall was constructed with void inside as the living place for people. In term of form, it is dominated by the characteristics of defense wall with little windows for lighting inside the house.

Defence Wall + Residence

Phase II, Citygate in Tung Chung, HK.

Program: pedestrian sidewalk, shopping stores

It is a newly constructed building and not yet started service the public. The bridge is the main connection that link up the cluster of schools with the Tung Chung MTR station. By the side of the bridge, there is a line of shopping stores. By viewing its exterior, it is just a bridge instead of involving other type of functions.



Bridge + Shops

Rethinking Points

After certain investigation on the concept of genetic modification and the actual case study of hybrid architecture; I believe, in somehow, they are diverse in certain extent. Genetic modification is concentrated on *quality improvement*. The scientists draw out certain DNA from an organism (e.g. carrot) and substitute this DNA in the chromosome of another organism (e.g. tomato). The outcome would be, generally speaking, the quality of the new generation of tomato is improved or it result a totally new product. Simply speaking:

1st outcome: Carrot + Tomato = Tomato
2nd outcome: Horse + Donkey = Mule
3rd outcome: broccoli + cauliflower = brocoflower

In case of hybrid architecture, the combination of different functional pieces result a new hybrid. While we can hardly see any linkage between separated functional levels, multi benefits is not really existed. Strictly speaking, hybrid don't result a "quality improvement".

Another critical point is the nature of hybrid architecture. Hybrid architecture is different to multiple functional building because of its limitation by city grid and its scale. Due to the confinement of land in city core, a lot of activities need to be carried on in a limit space, it resulted a vertically developed structure that involved different functions inside. It means that, for hybrid architecture, *quantity is essential*. Only a building that can carry a wide range of activities inside is architectural hybrid. Again, the emphasis on quantity in hybrid architecture is contrast to the quality approach of genetic modification as it involved only 2 organisms.

In case of HK, hybrid is not only happened within a single tower.HK hybrid is worked together in group of buildings. While at the same time, users keep on changing the functions of area. As a result, the building becomes more complex and heterogeneity.

In short, GMO is different to hybrid architecture in term of concept are:

1. GMO emphasis on quality, hybrid architecture emphasis on quantity.

2. GMO involves a mixture of 2 organism, while hybrid architecture just put different functions together and there is no mixture between them.

New Interpretation of "Hybrid"

It is very easy to blur the concept between "multiple-functional" and "hybrid". Their main difference is in term of scale, form and land occupation.

Hybrid is the result of scarcity of land which leads to the development of different functional space squeezed within a single building block. So its form and scale is unusually confined by the city grid. While multiple-functional building *may not* be affected by the city grid in term of form. Coming to the very early of my concept GMO (genetic modified organism), the above definition of hybrid can no longer fit with it. Especially taking the case studies in HK, most building are fabric hybrid with similar appearance. Different functions are vertically placed top on each others; no interaction is happened at all between levels.

For this reason, I would like to re-interpret the type "hybrid" which would become my design statement:

Hybrid involves a transformation of form for which 2 different architectural hard wares are put together, emerge and transform in term of form.

Hybrid involves functional integration of the 2 architectural programs that multi benefit one another, enhance efficiency and performance.

Hybrid provides different functuinal quality that efficiency and users' convenience is enhanced.

Special Attention:

What is "Quality Improvement"?

When we talk about quality improvement, certain criterions should be set to justify if quality improvement did exist after internal variation of an organism. In term of GMO, such as the vegetable, i.e. tomato and brocoflower, it is clear that the criterions can be nutritive value and the preserve period. However, in architecture, it is really hard to say what is the criterions are. Is aesthetic important that function? Or user concern is more important than architects' views"?

In this thesis, I would like to set the Functional Efficiency as the main and the only criterion. The main purpose of hybrid architecture is to enhance space availability, while in some case, the combination of 2 particular functions result better use of space and improved users' convenience. Take Citygate as the example, the mixture of shops and bridge ensure a safe and nice pedestrian path to the Tung Chung MTR station instead of walk across the highway. At the same times, users can enjoy window shopping or actually buy their necessities on the time they bypass the bridge. As people are necessary to pass through the bridge, the flow of people is guaranteed which ensure the shop keepers a promising profitable income. The 2 functions, i.e. bridge and shops, mixed and work cooperatively to enhance the both spatial efficiency and user convenience.

Earth House is another example to demonstrate the term "functional efficiency of hybrid". It is classified as the 2nd outcome with only form transformation without quality improvement. It is because not both functions are improved in term of users' convenience. There is no doubt that earth house provide a strong protective shelter for the residents against the bandits. However, they had sacrificed their living condition. When even houses were separated, the families usually had an independent courtyard and pigsty from poultry. When the houses were grouped together to from a round-shaped earth house, the amount of space for each family was drastically reduced. A common courtyard was shared amount 20 families. The space was very restricted and living condition was crowded. In this case, the 2 functions, i.e. fence wall and houses are not "both" improved in efficiency. As a result, there is no quality improvement.

By introducing the carrot¡¦s gene into the tomato, the life cycle of t
he new generation is prolonged, tomato can be kept longer.
Quality improvement is resulted in this type of GMO.

Part III

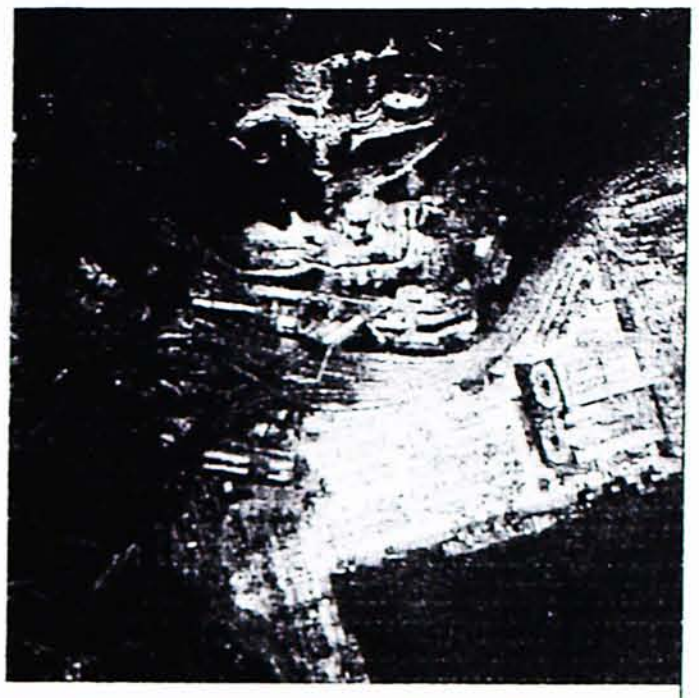
Site Information in related to Design Concept

Proposed Site Area– The Kwai Chung Cargo Terminal

Kwai Chung Cargo Terminal as the potential site for alternative hybrid development due to the following reasons:

1. Site - Sea Vs Land

The Cargo Terminal is somehow a very special area. On one hand, it is the coastal area that connected to the sea. While the opposite side is linked up with the land and bounded by the highways.



Arial Photo of the Kwai Chung Container Terminal,29/05/2002

2. Building - Static Vs Drastic

Once when you visit the cargo terminal, you would see something very interesting. From the façade of the building, you can lines of vehicles keeps on moving inside the building. The building is "static" while the vehicles are "drastic"; however, they are combined as a single block at the time.

Building facade keeps on evolving due to the continuous flow of trucks

3. People - Open Vs Close

It is such kind of unique geographical location that makes it possible for hundreds of cargo ships and vehicles come in and out from the area. It is no doubted that the terminal is very "opened".

However, the area is also very "isolated" and "closed". No people would go to the area except the terminal staffs. Its land edge is completely bounded by the highways which isolated the area from the others. When I walked along its boundary, I could hardly see a person. I walked to the cargo terminal gateway, entry is not permitted. Even I just want to take a photo from outside; the securer stopped me to do so.

4. Container - Heterogeneous Vs Homogeneous

The containers, the essential elements of cargo terminal, are also very special in its nature. From the outlook, most of them are the "same", same in size, form and construction material. They are "homogeneous". On the other hand, they can be viewed as "heterogeneous". Some of them are "static objects" that firmly stored in the terminal area, while some are "moving objects" that travel around by vehicles and ships. Such kind of "static" and "moving" stage is on shifted.

How was the Port in the past?

In the past, port was usually located near the t own due to their close economic linkage. Port was used not only as a transport interchange but also a market place for good and information transaction.

The Star Ferry Pier together with the Old Tsim Sha Tsui Railway Station

In the March of 1916, the Old Tsim Sha Tsui Railway Station was opened and it was located by the side of the Star Ferry Pier. By that time, the pier area involved a high level of human activities, i.e. people and goods from both ships and trains. The close connection between the port and the railway resulted a high efficiency in term of good transaction as well as people mobility. It became a place for people gathering and good exchange.

By the 1975, the Hong Hom KCR Station replaced the Tsim Sha Tsui Station as the end point of the HK railway. The transport of human and goods was also separated. Nowadays, our railway system is used for human transportation while trucks taken up the responsible to carry cargos.

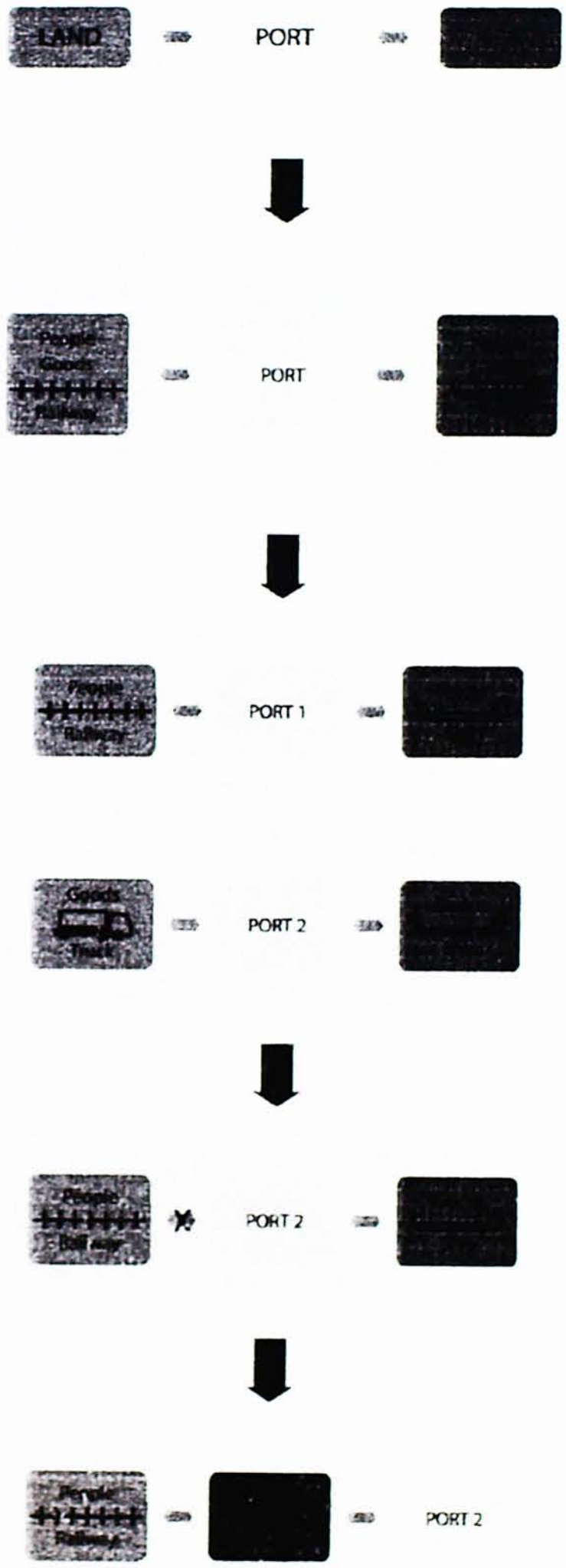
The historial photos of Star Ferry Pier together
with the Tsim Sha Tsui Railway Station

What happened to our Port?

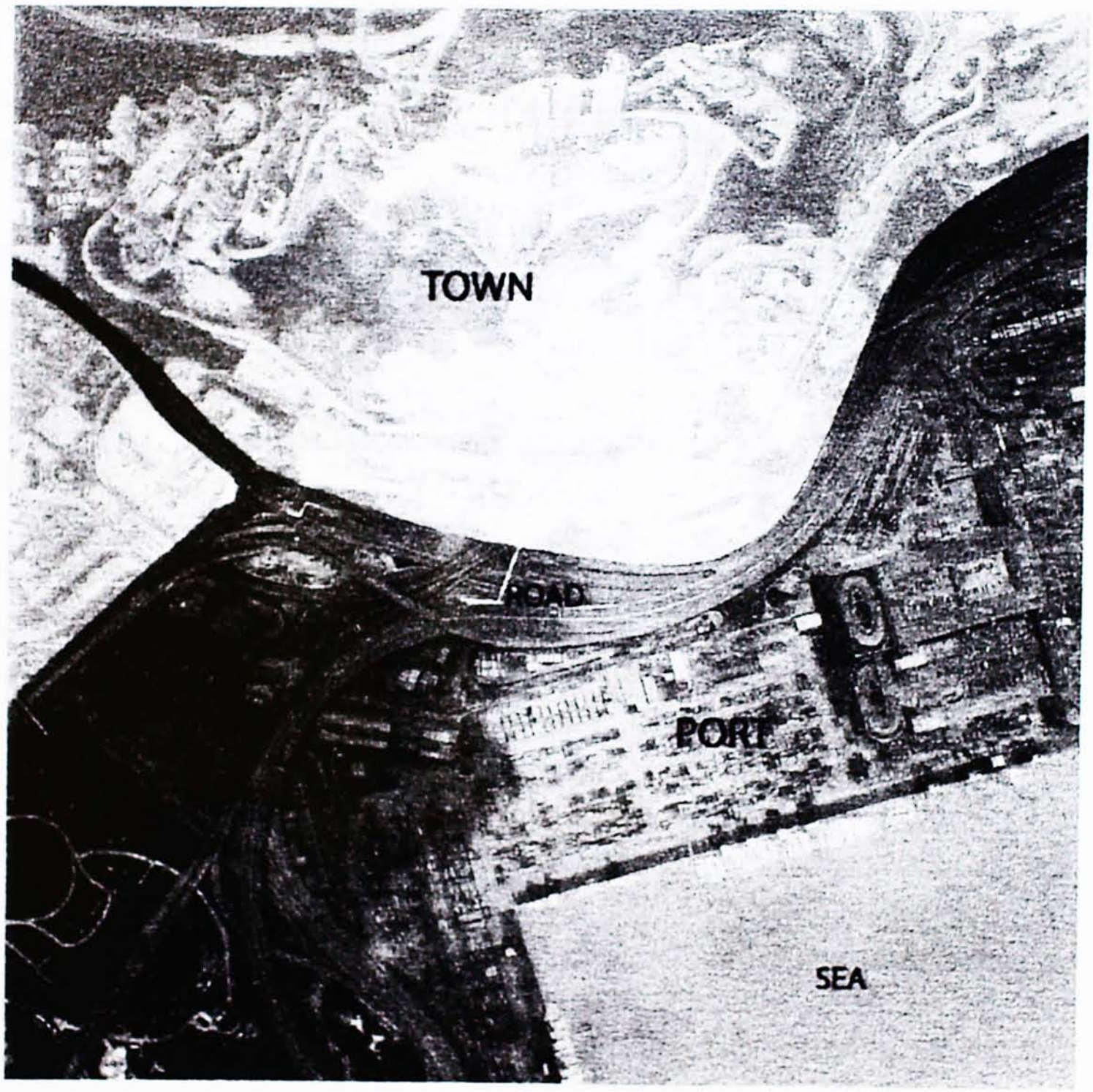
At the very beginning, port was a direct connection between land and sea. As the town started to be developed in larger scale, town was no longer closed to the port. People come to the port by mean of variable transports, i.e. railway. While the goods were transported to the the port by cargo ships.

As population keeps growing in HK, the demand on sea transportation was on the increase. As a result, ports were arranged for people or for goods only.

For example, the Tsim Shu Tsui Port is mainly used by passengers while the Kwai Chung Port is used for cargo dealing. It resulted that some of the cargo port become no man zone. The active economic and human activities is disappeared in the port area. While the connection between town and port is also broken.



Can the Port re-establish the relationship with Town?



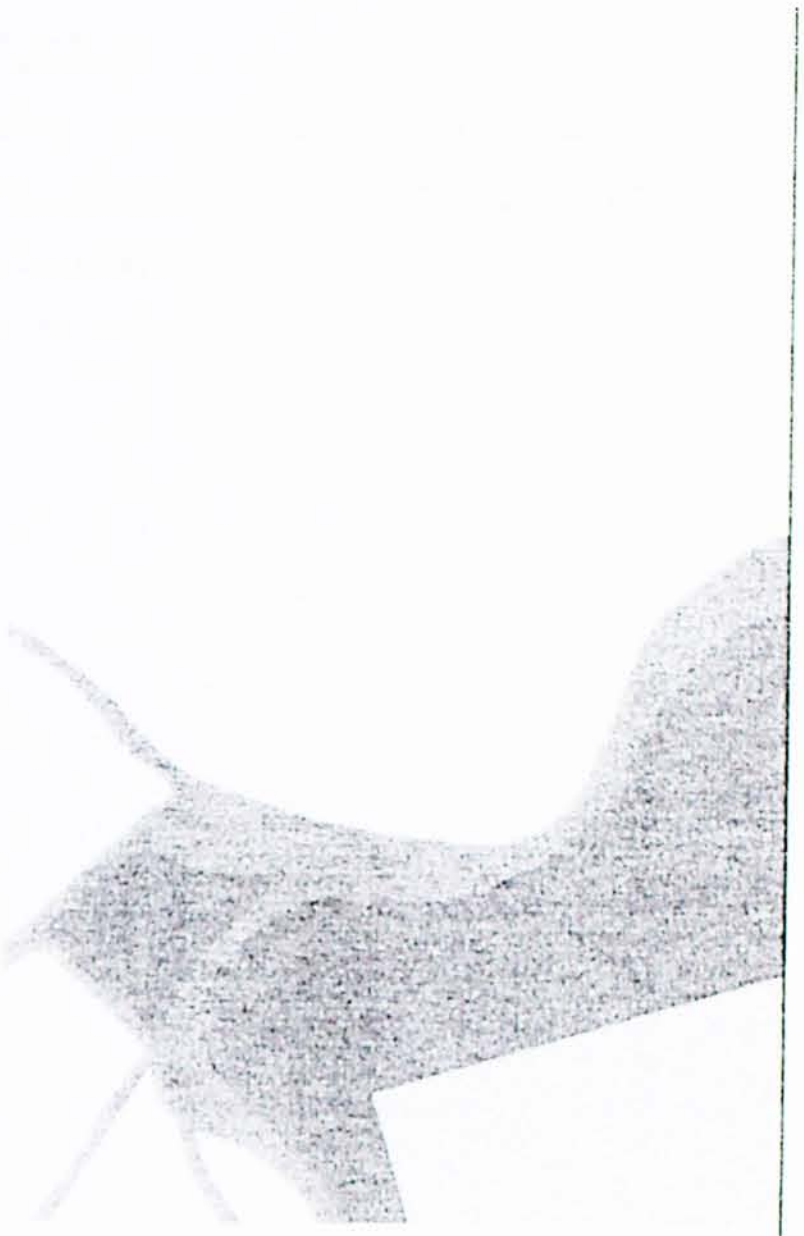
The Arial Photo of the Kwai Chung Container Terminal

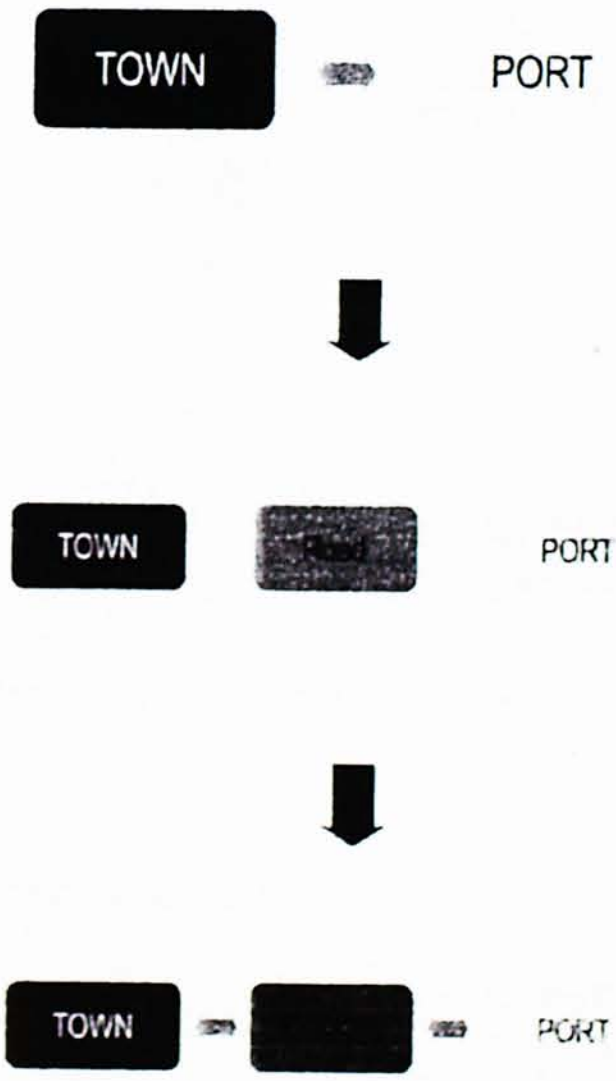
A Building Program between Lai King MTR Station and Kwai Chung Cargo Terminal

The Kwai Chung Container Terminal is completely borden by the coast as well as the Kwai Chung Highway. This physical constraints lead to a total isloation of the Port from its surrounding area. The level of human activities are exteremly limited.

The design strategy is to break up the isolation by intiating a prgram between the port and the town so that a connection can be re-established and human activies can be increased nearby the port area.

Under the present site condition, there is a bridge that connected the port area to the Lai King MTR Station.Such connection can be further developed and enhanced by the new building programs. In addition, people flow from the MTR station to the new building can be guaranteed, approximately 140,000 people bypass the Lai King Station.





The Inter-changing Stations of the HK Railway System

The MTR inter-changing stations are the merging points of 2 railway lines and the Lai King MTR Station is one of the example. It is expected that the interchanging station would involve a higher level of human activities, however, it is not the case in our railway system. The MTR inter-changing stations can be clarified into 3 different levels in term of people movement.

1. A "STOP"

A "STOP" inter-changing station is point that people come to the area and have different activities. People would stay there for time.

e.g. Central Station, Admiralty Station and Mongkok Station

2. A "STOP" and A "PASS"

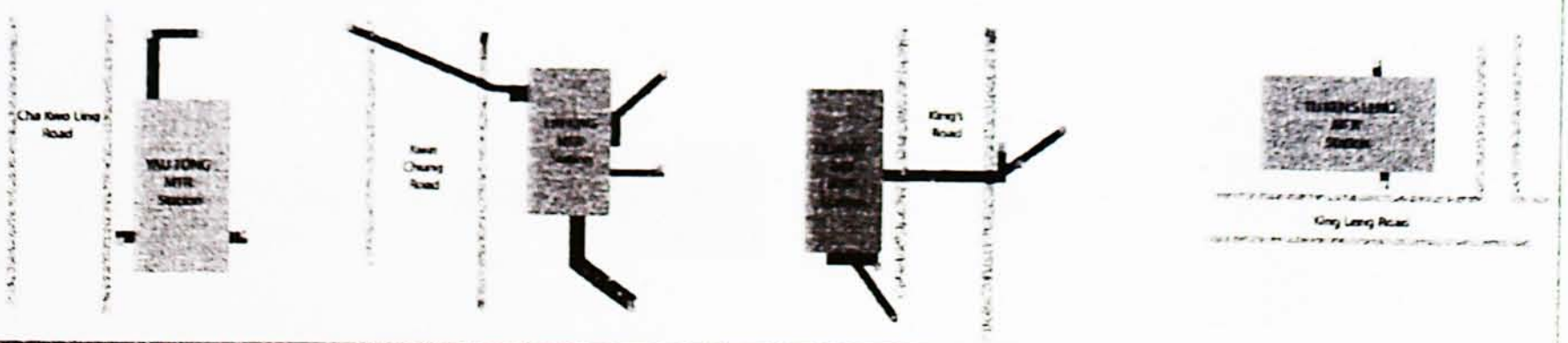
A "STOP" and "PASS" inter-changing station involved a lower level of human activities than a "STOP" station. Certain amount of people would bypass the area and not stay there for activities.

e.g. Hong Kong Station, North Point Station and Prince Edward Station

3. A "PASS"

A "PASS" inter-changing station is a station, other than for work and go back home, people would not stay in the area for various activities. Most people would bypass the area when taking the train.

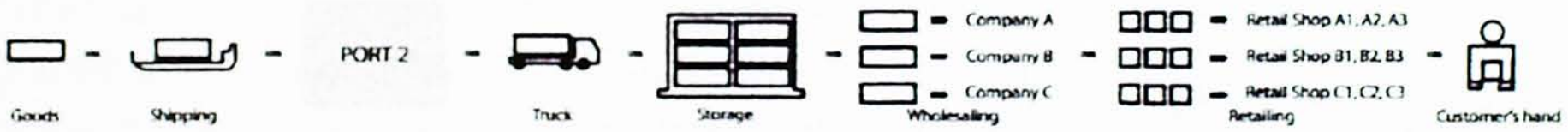
e.g. Quarry Bay Station, Tui Keng Leng Station, Yau Tong Station and Lai King Station



The Logistic Chain

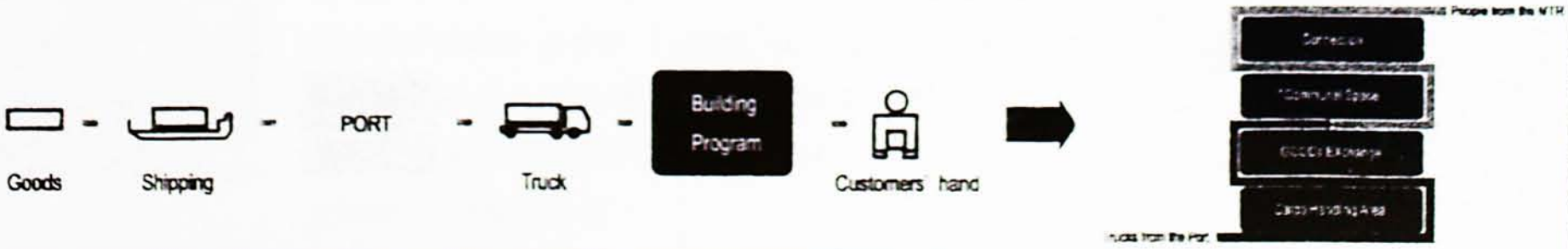
The Logistic Industry involved many partners to facilitate the transaction of goods. By studying it procedures, the functions of the building programs can be developed.

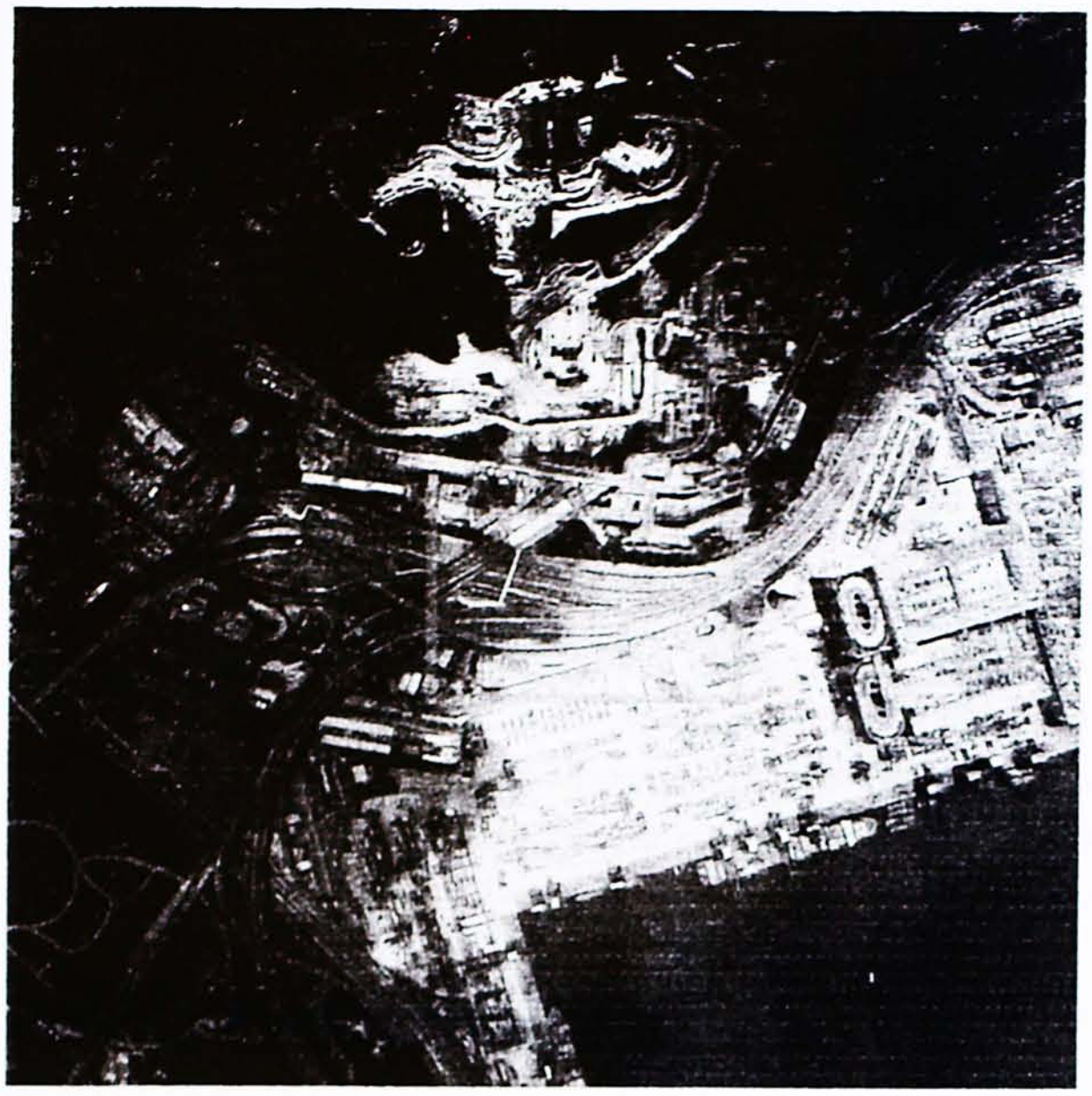
1. The Supply Chain
   - finished products in store
   - monitored inventory and store condition
   - received orders from buyers
   - check product amount, store location
   - detect potential delay and inventory wastage
   - confirm delivery time and price
   - Transmission of receipts and goods
2. The Demand Chain
   - constant market forecast
   - selection of products
   - check deliveries schedule
   - selection of suitable suppliers
   - secure storage/ transport arrangement/ inventory level/ Customs compliance
   - confirm product amount and price
   - transport and store in the right place
   - received orders from retailers
   - scan and pack
   - deliveries to the retailers

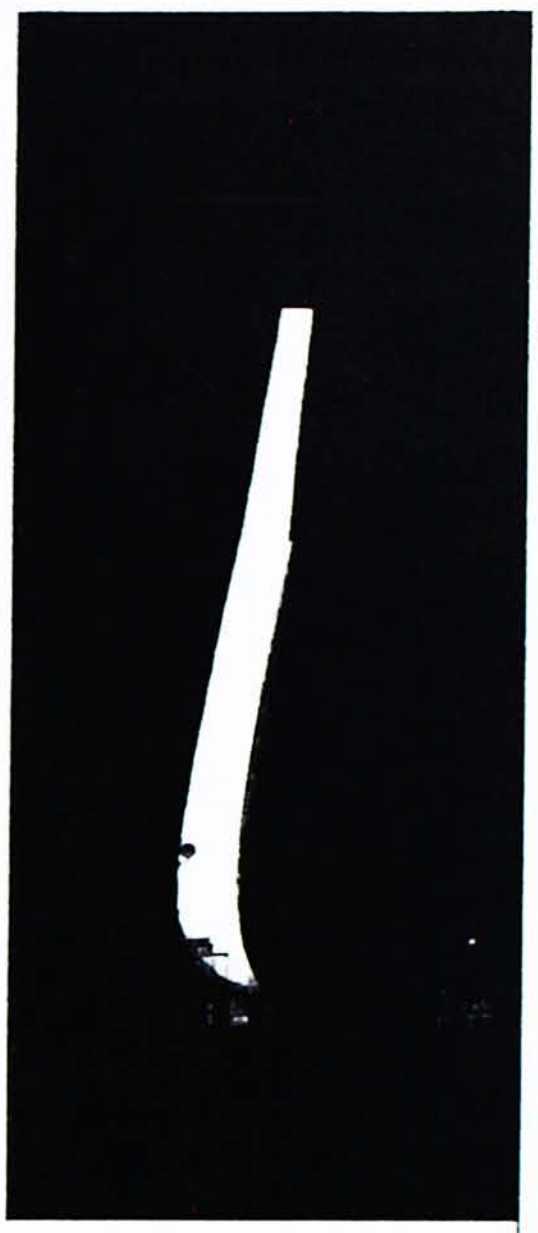


Building Program by mean of Logistics Chain Encoding

By logistics chain encoding, specific programs can be identified. ***Program hybridization*** is adoptable which shorten the cargo handling process and lead to an ***improvement in efficiency***. As the logistic program of cargo handling, storage, information exchange, wholesale and retail are grouped together in a single structure, time and cost spend on transportation can be minimized.

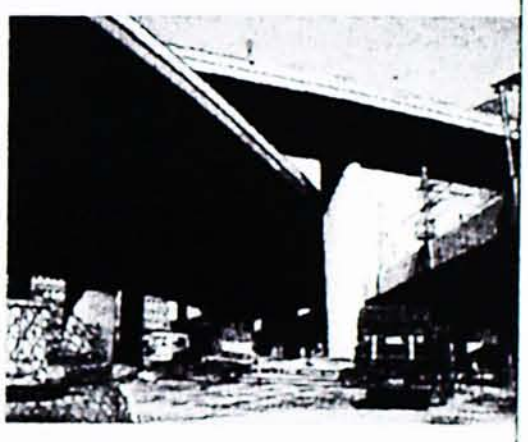






The Site and the Site Condition

The selected site is located between the Modern Terminal LTD and the Lai King Town. Its location allow a direct connnection to the Lai King MTR Station in addition to the Container Terminal just on its western side. The site boundary is defined by the Kwai Chung Road as well as the Container Port Road. Quite a number of flyovers are above the site, the area is indeed an empty space that left undeveloped under the flyover and is recently used as temporary truck parking and container depot. There is nearly no human activites, most people would bypass the site and go to the surrounding terminal buildings.



Special Attention:

What's the Problem in the Container Port?

After the hoist of typhoon signal, ***serious traffic congestion*** always happened in the Kwai Chung Road. Most of the trucks are rushed to the port for loading and unloading the cargo in order to meet the shipping schedule or the purchase order. ***Traffic queue is appeared earlier in the roads on the ground*** as the loading and unloading processes are taken place on that level.

How to generate an Hybrid – the Methodology of creating a Genetic Modified Organism (GMO)

In 1866, Mr. Gregor Mendel published the results of his investigations of the inheritance of "factors" in pea plants. By underlying the hybridization of life-forms, the ***biological and mathematical*** foundation of cross-breeding process was established. It proved that cross-breeding of animal or plant is possible to generate new species with greater hardiness and growing capacity. Nowadays, this biological technology is widely adopted in improving the quality of crops. By encoding the DNA chain of a particular crop, specific gene in chromosome can be identified and transplanted into the DNA chain of another crop that leading to quality improvement.

Basically, there would be 3 outcomes under the genetic hybridization:

1st outcome - **Quality Improvement**

e.g. carrot + tomato = tomato

2nd outcome - **Different Form**

e.g. horse + donkey = mule

3rd outcome – **Quality Improvement and Different Form**

e.g. broccoli + cauliflower = brocoflower

*This Thesis Proposal is aimed at creating an **Architectural Hybrid** under the **methodology of GMO** with the result of **Quality Improvement and Different Form.***

The 3rd case: the GMO with both quality improvement and different form

Part IV

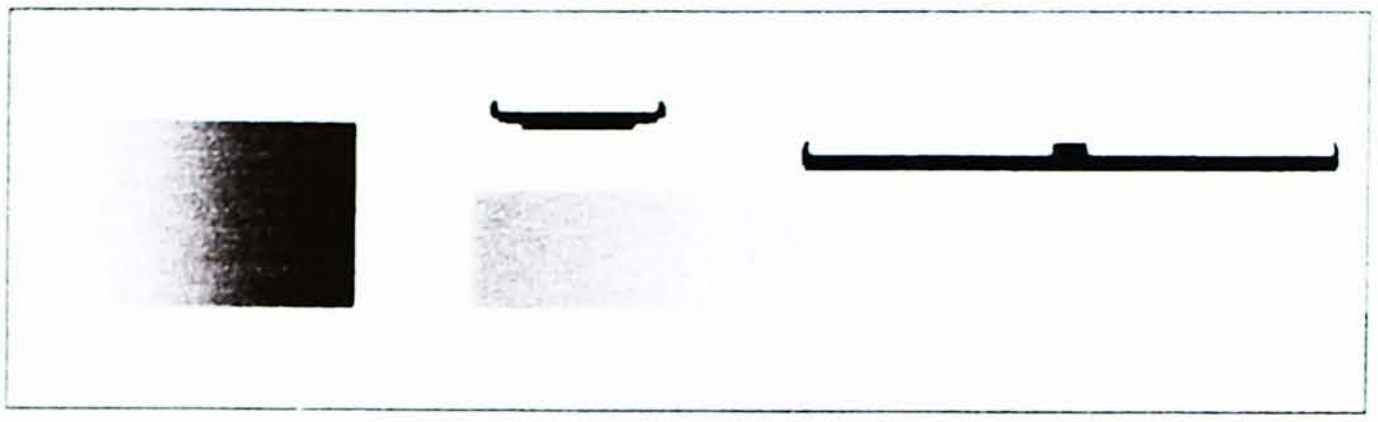
The Building Design

Building Form – Hybrid Bridges

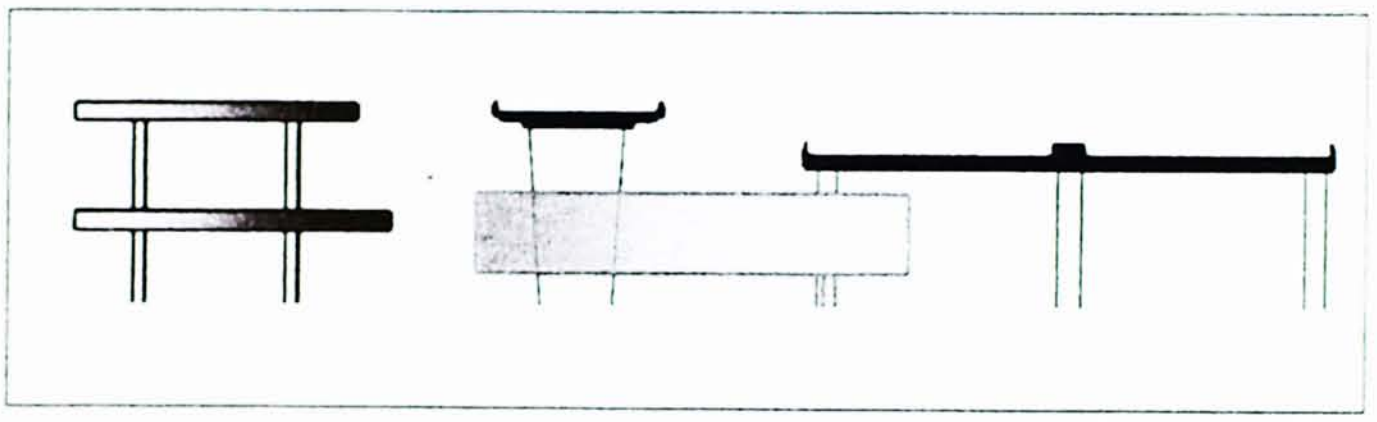
Bridge as hybrid and a transformation of road. Owing to the city development and scarcity of land, structural columns are injected as new component to elevate road upward.

The ***building form would undertake a hybridization process with bridges*** on above. The form outcome would be neither purely a bridge nor a building complex.

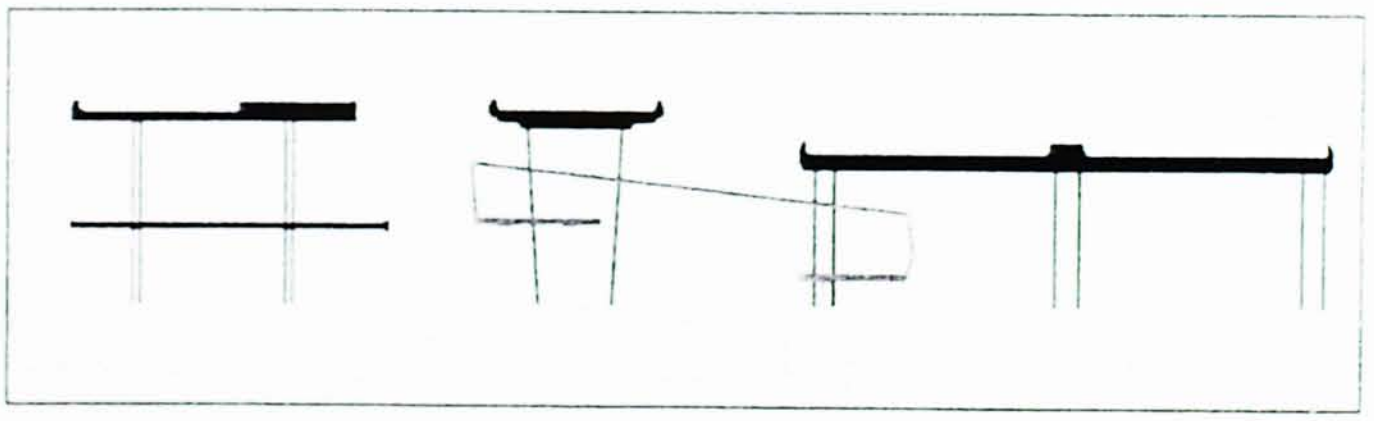
Scale and Proportion



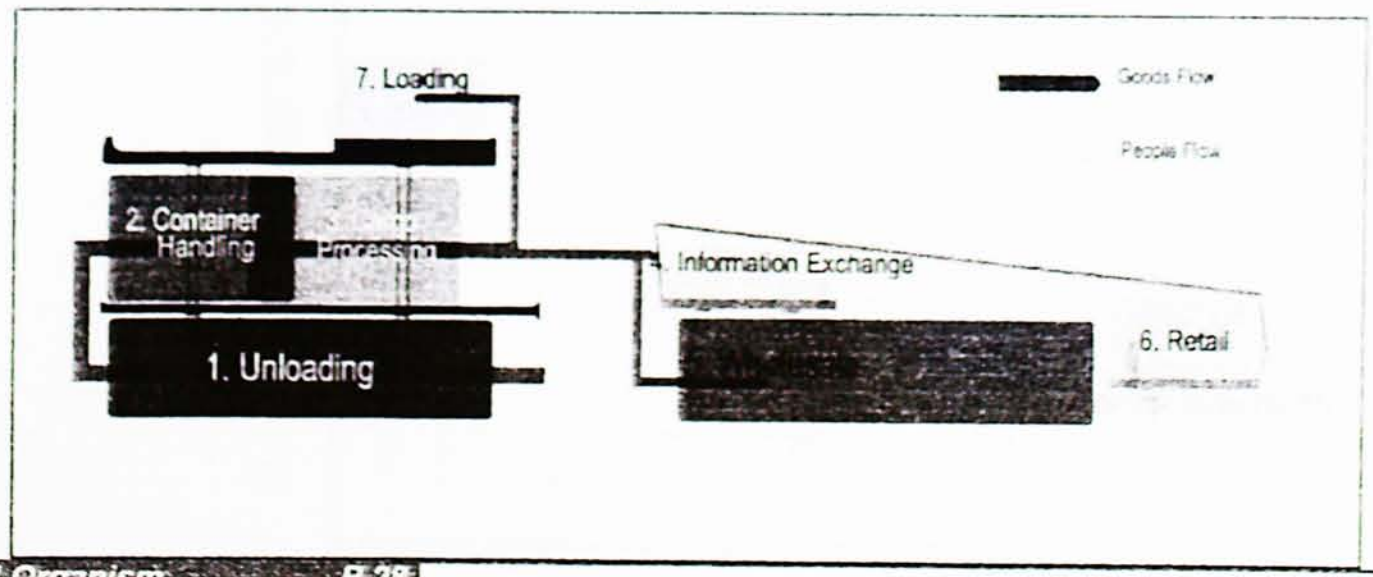
Structure



Edge



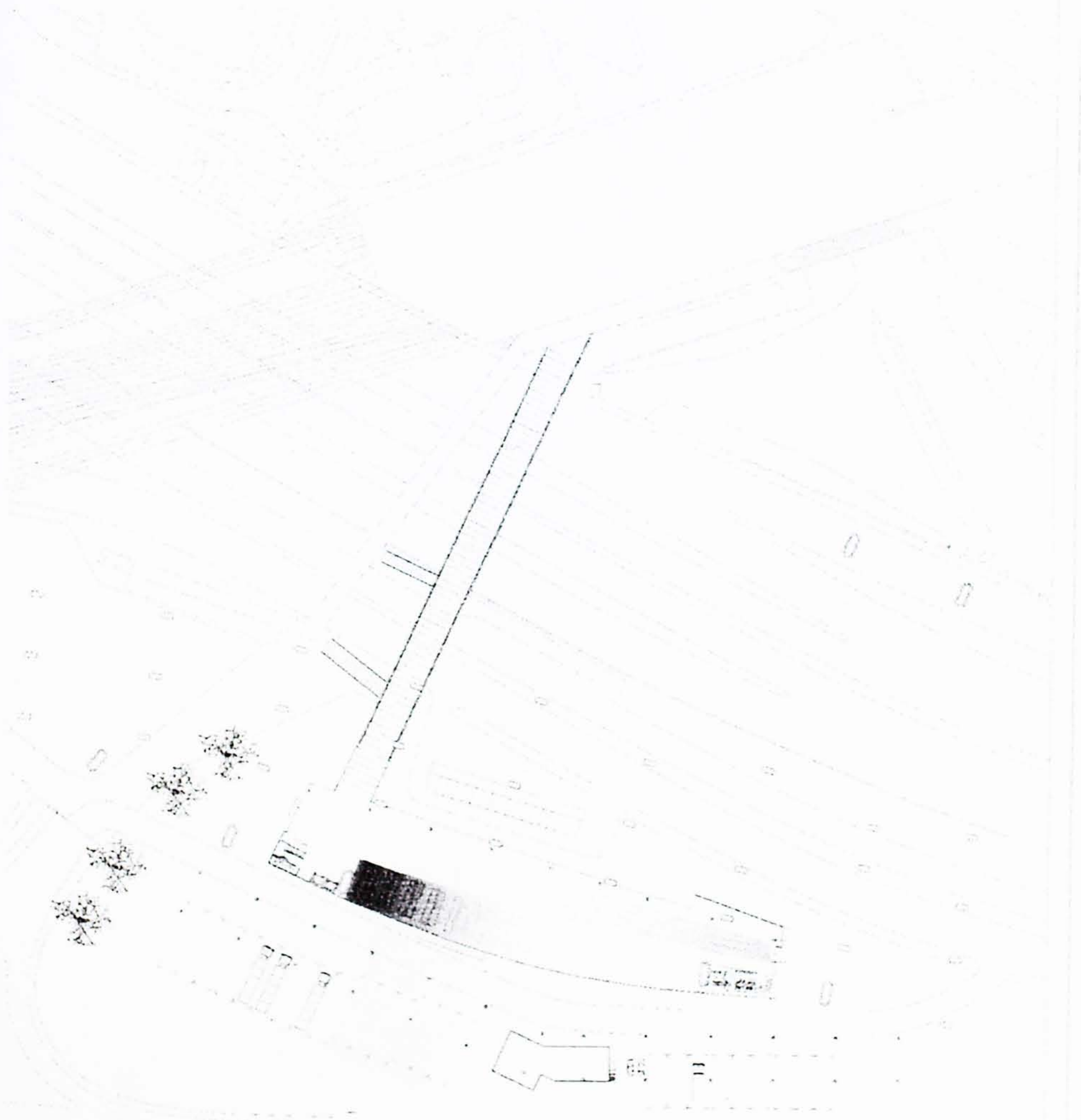
Sequence of Cargo Processing



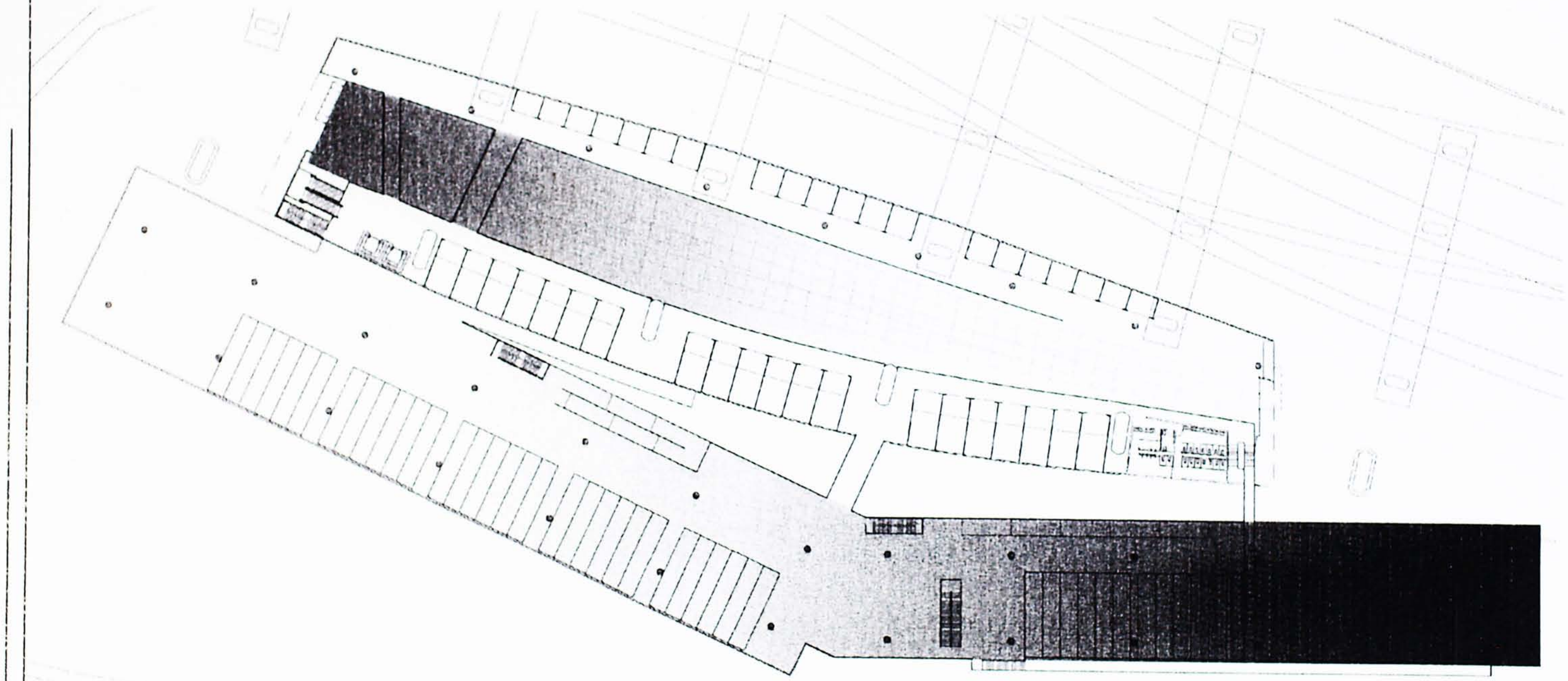
Building Programs

Logistics Sequence	Building Programs	Area	Users
Transportation	Carpark	1,300m2	Drivers and Workers
	Unloading Area	2,000m2	
	Road	1,200m2	
Container Handling	Container Handling Area	2,500m2	
	Container Depot	2,000m2	
Cargo Handling	Storage	1,500m2	
	Scan and Package Area	500m2	
Management	Offices	200m2	Officers
Information and Goods Exchange	Product Showroom	100m2	Mechandisers, Retailers, Shopkeepers and Customers
	Retail Units	300m2	
	Wholesale Market	1,200m2	
	Loading Area	1,170m2	
	Highway Connection	2,000m2	
Supplumentary	Food and Snack Corner	50m2	
	Bank	10m2	
	Building Services:		
	Mechanical Plant Room, Water Pumping Station, Lifts and Stairs, Toilets	560m2	

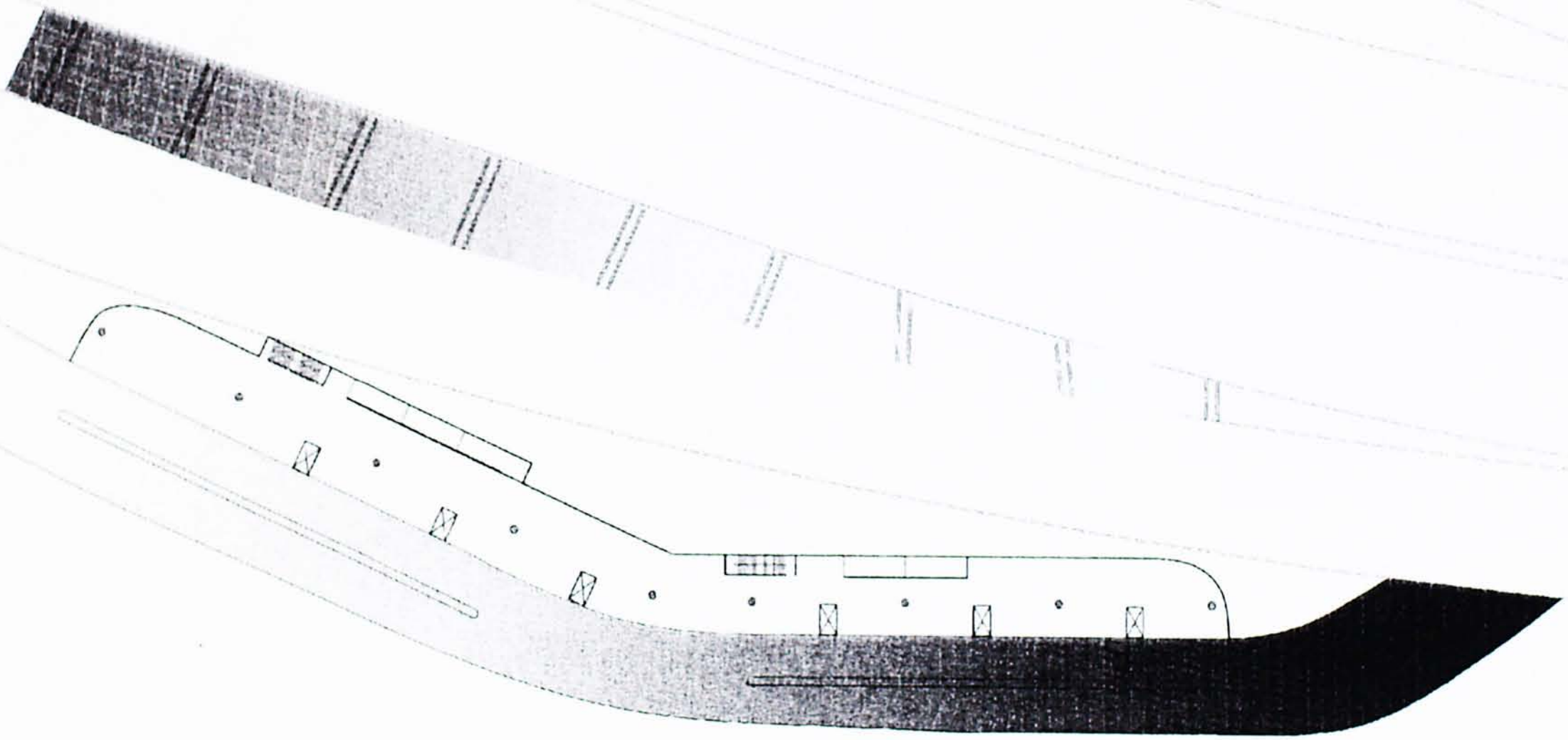
Ground Floor Plan



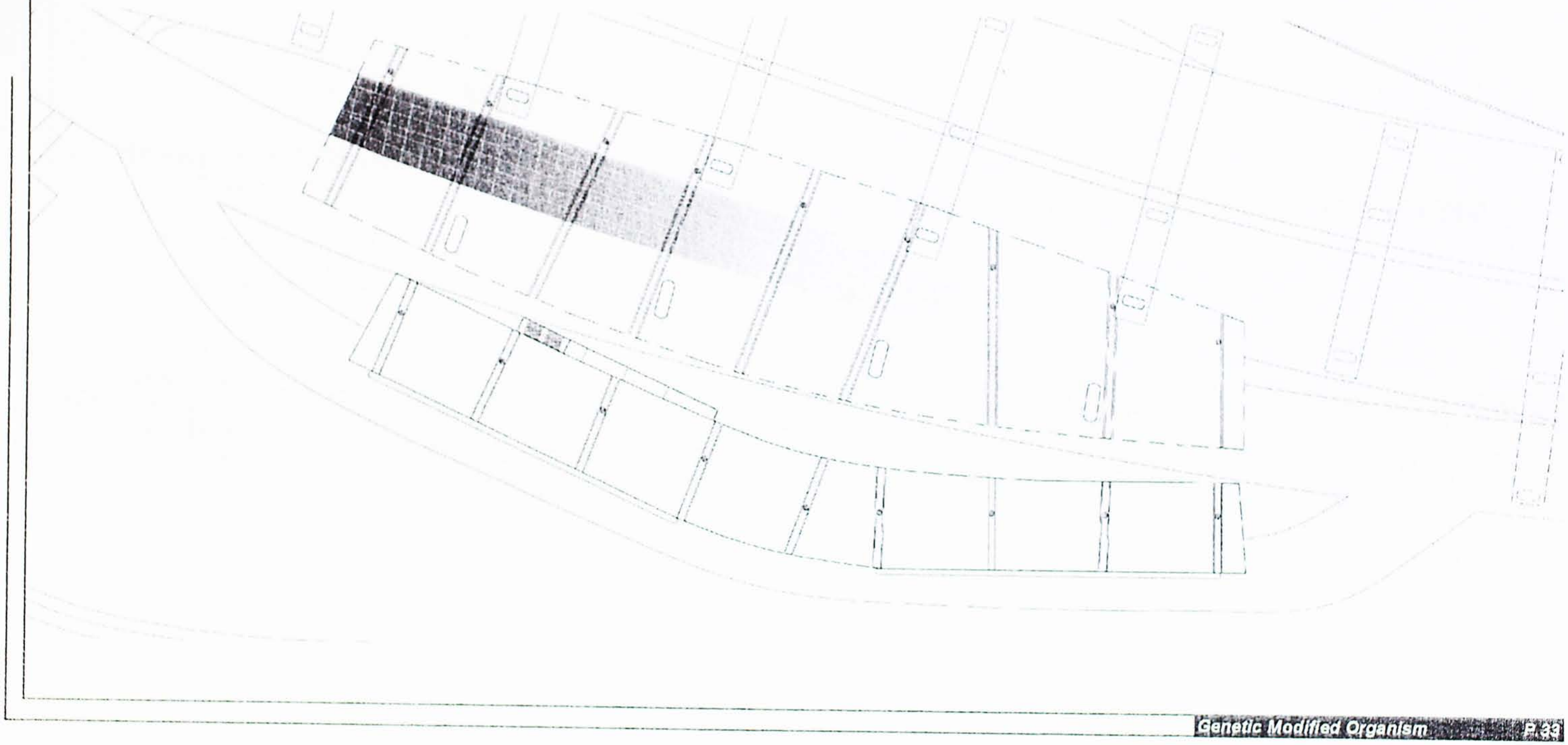
Second Floor Plan



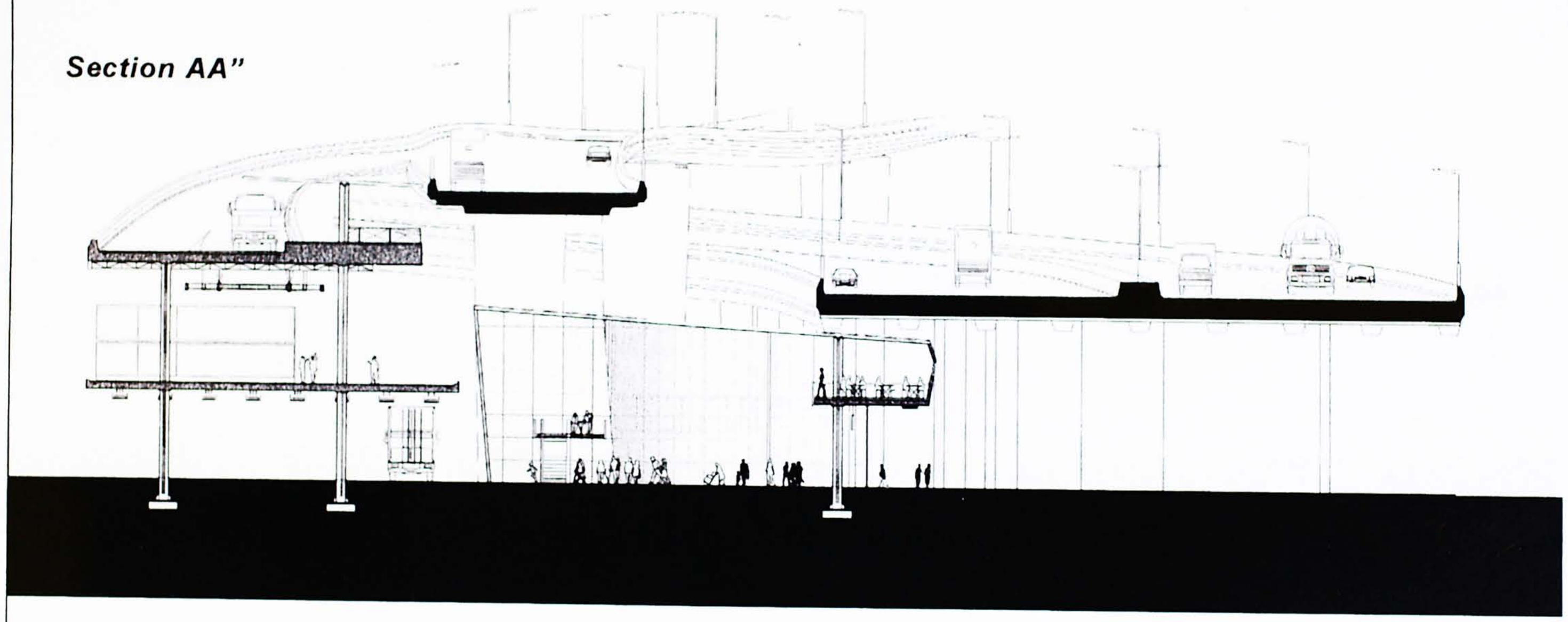
Third Floor Plan



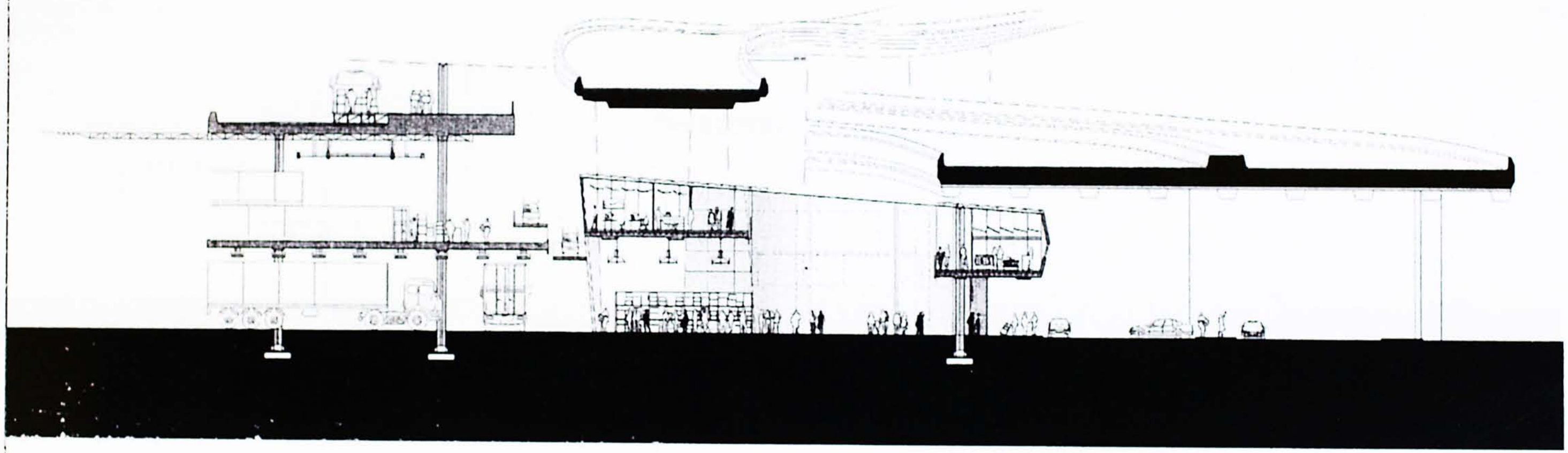
Roof Plan



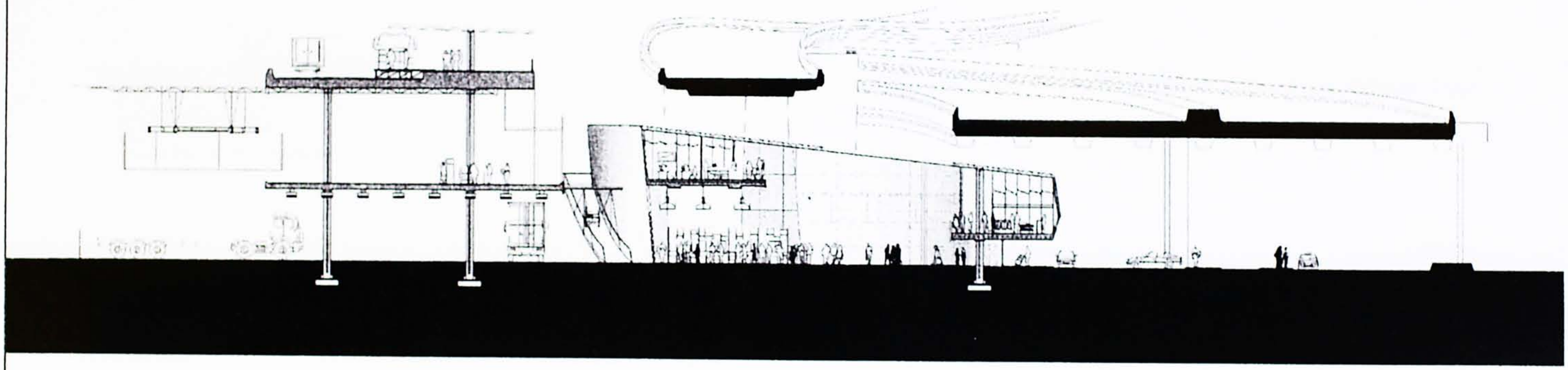
Section AA"



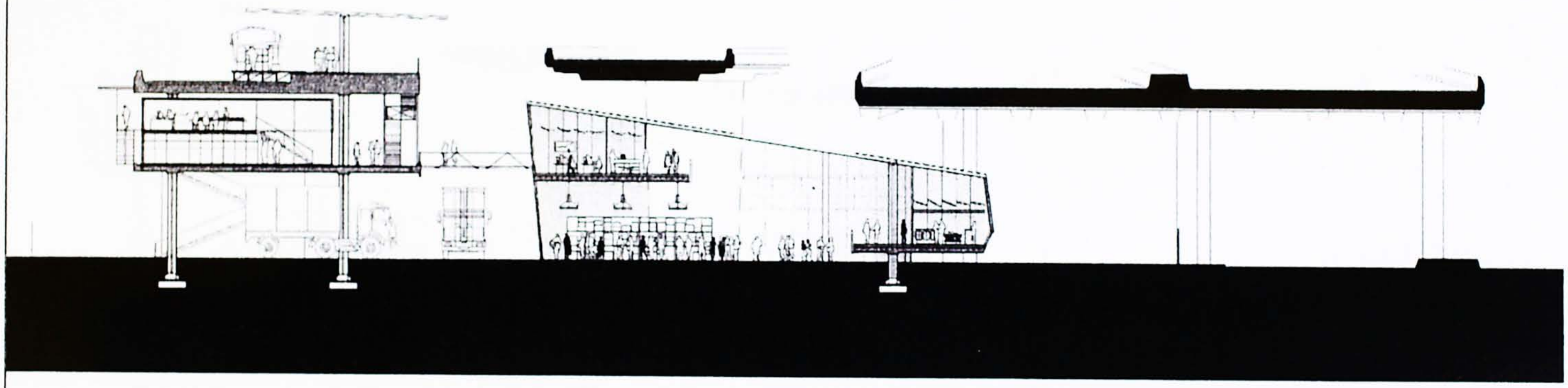
Section BB"



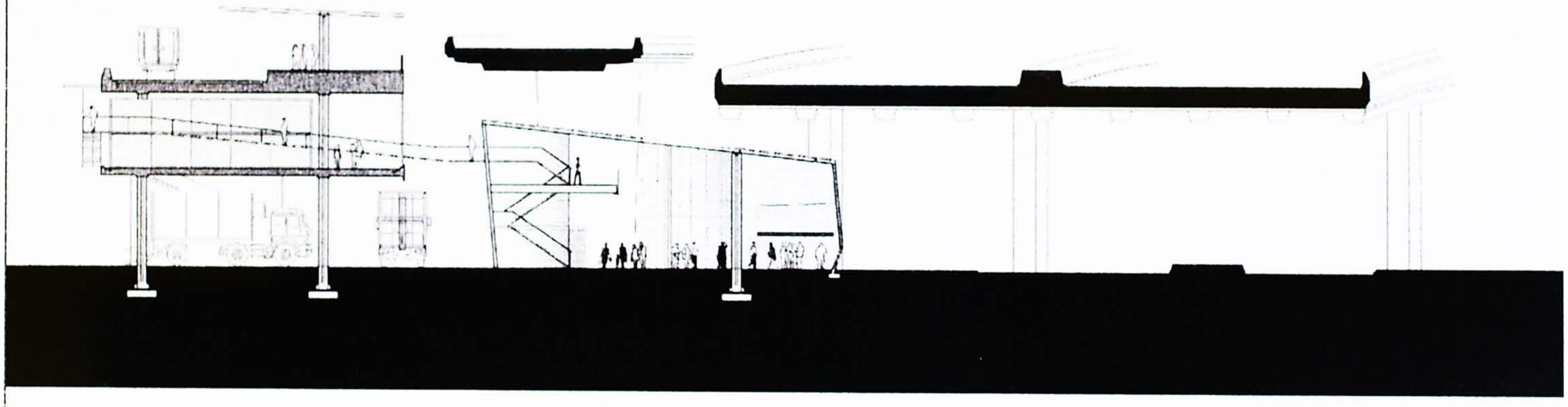
Section CC"



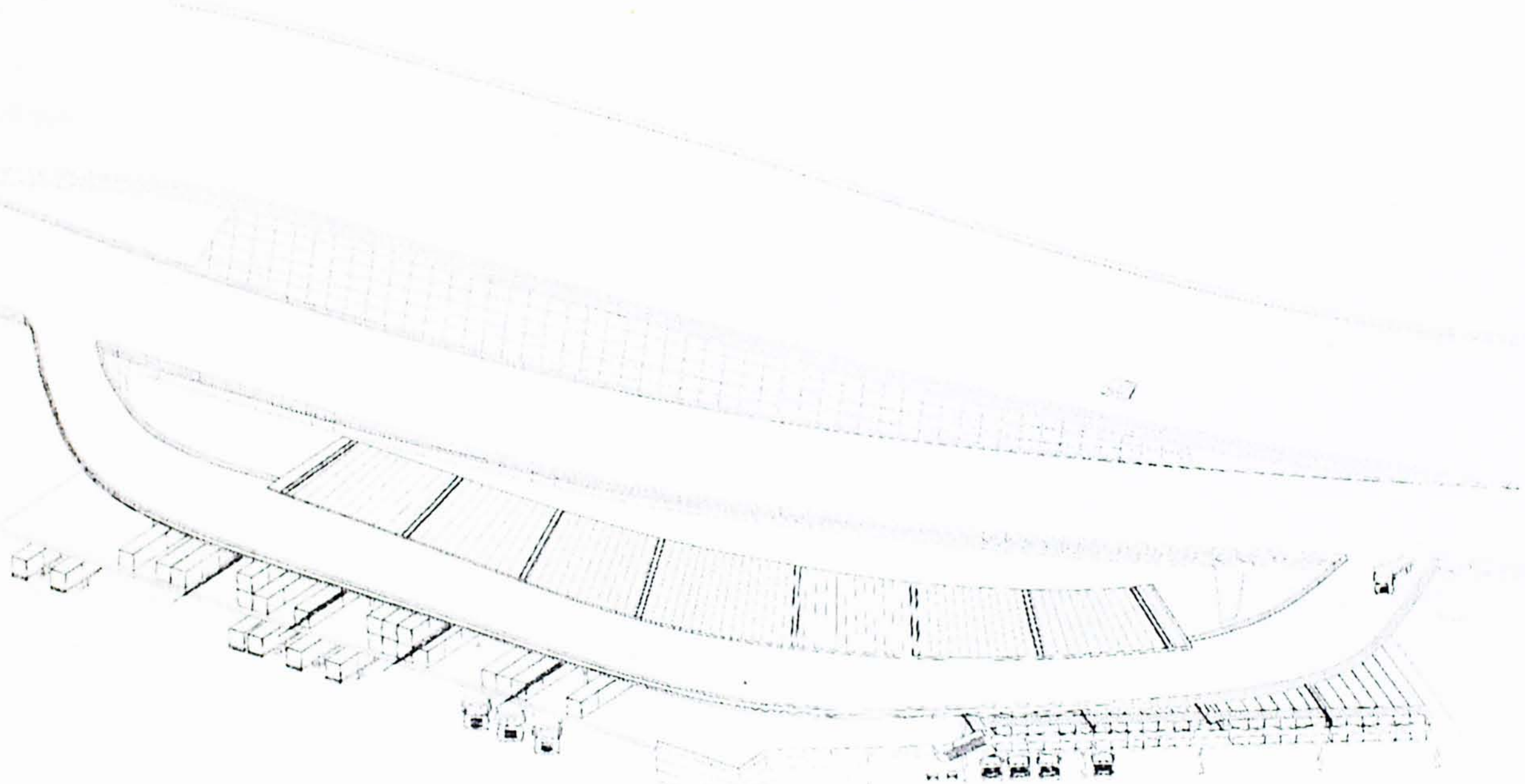
Section DD"



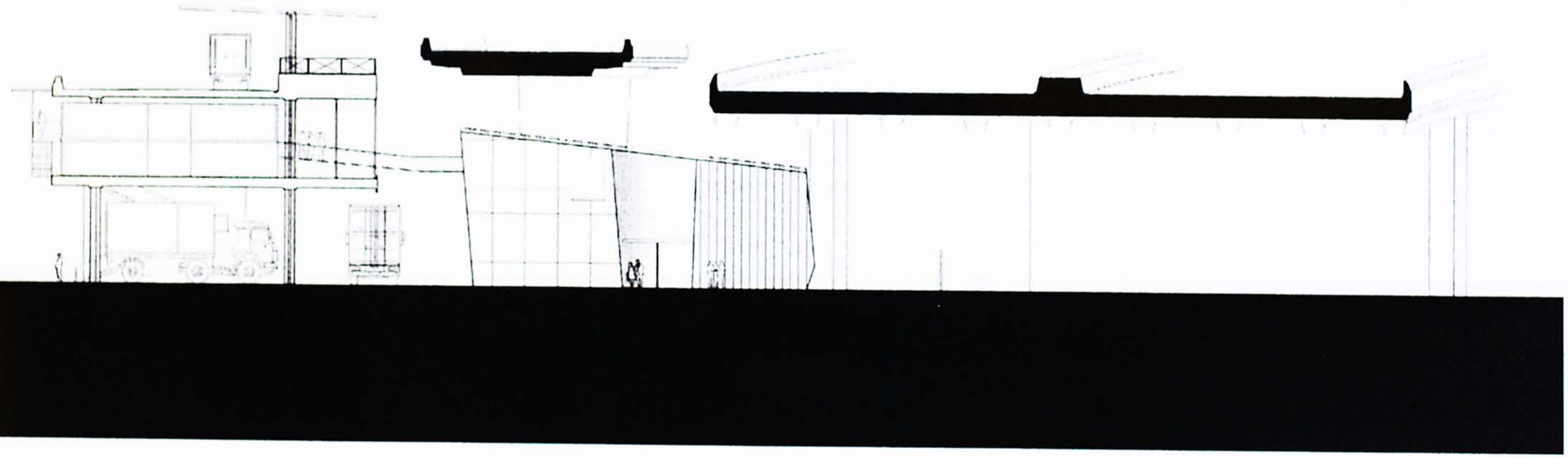
Section EE"



Isometric



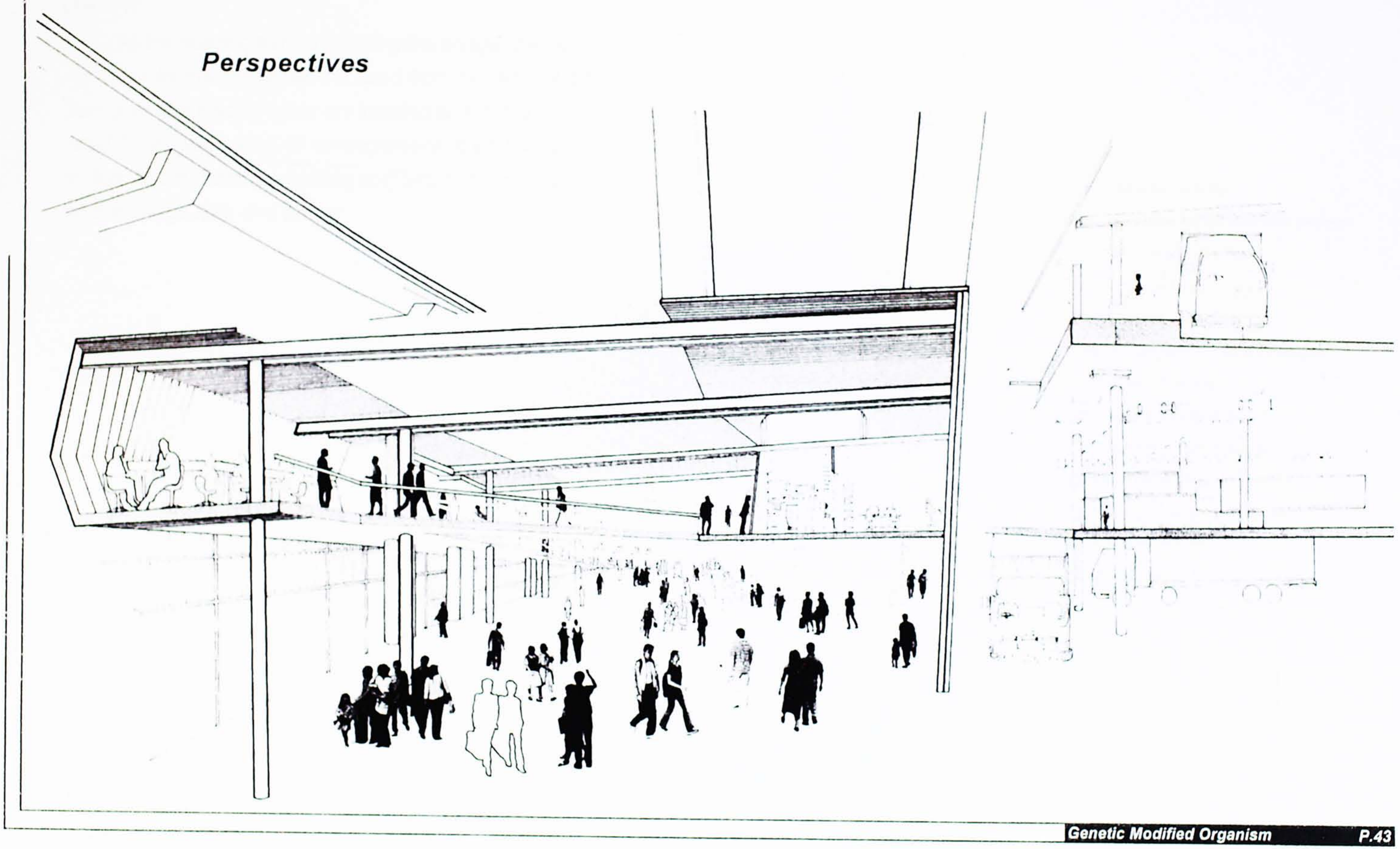
Elevation



Elevation

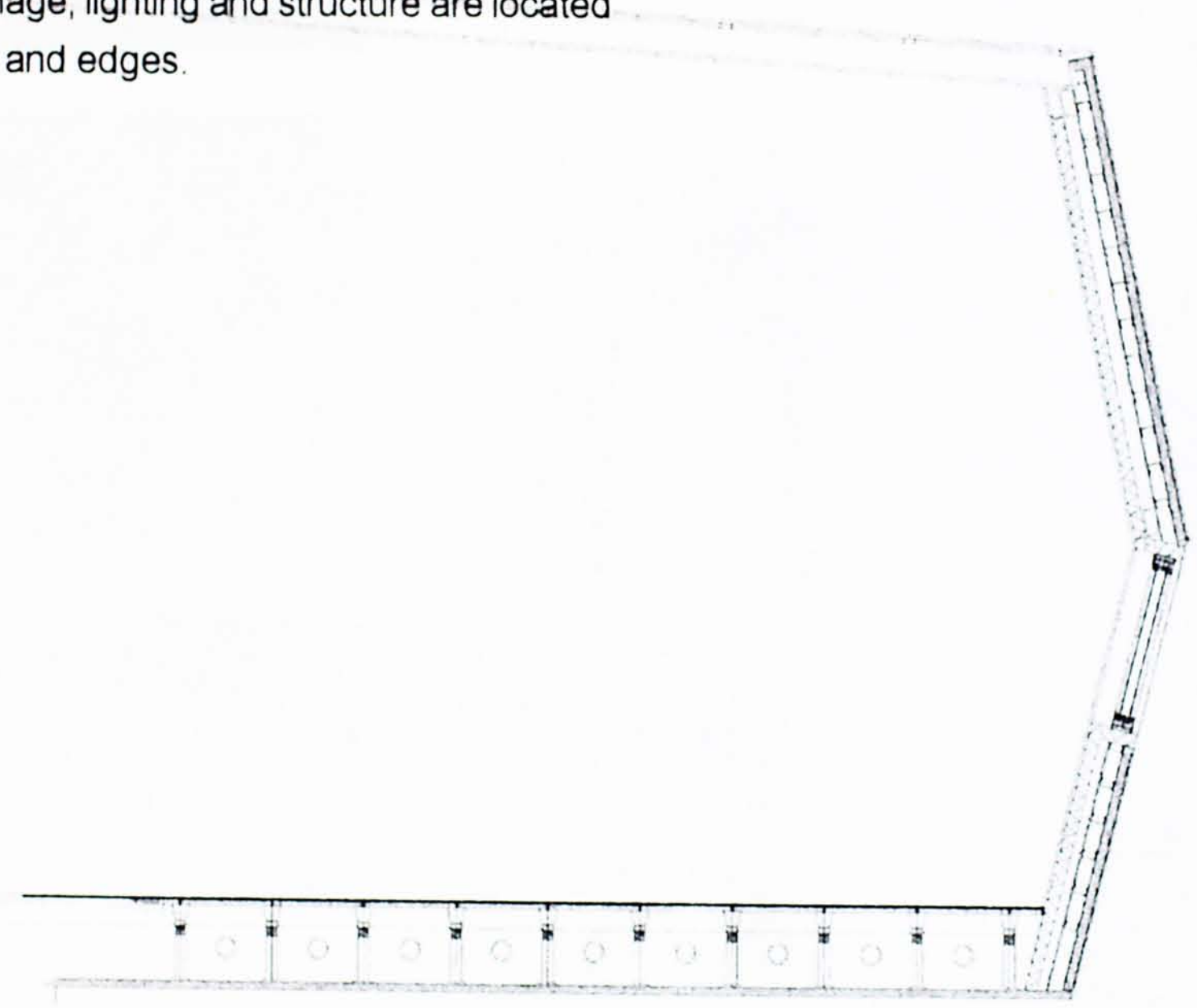
Elevation

Perspectives



Detail

As the building form is imitating the bridge, the building services are put under the rised floor system. All the pipe duct and electric wires are located on the gap of the rised floor. Such kind of arrangement is same as the bridge, all the drainage, lighting and structure are located on the bridge slab and edges.



20mm stainless-steel tile

0.5mm galvanized sheet steel bent to shape

200/200/7/10mm steel I-beam

75/75/7mm steel angle

150/100/6/9mm steel I-beam

75/45/15/3mm cold-formed steel section

10mm surface finishing

10mm waterproof membrane

50mm lightweight concrete slab

150/150/7/10mm steel I-beam

70mm glass-wool thermal insulation

10mm surface finishing

10mm float glass

Sheet-steel window frame

10mm Carpet Finished

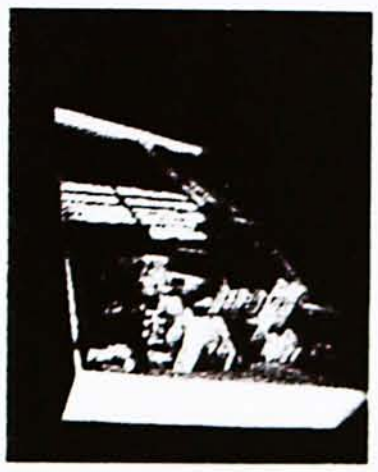
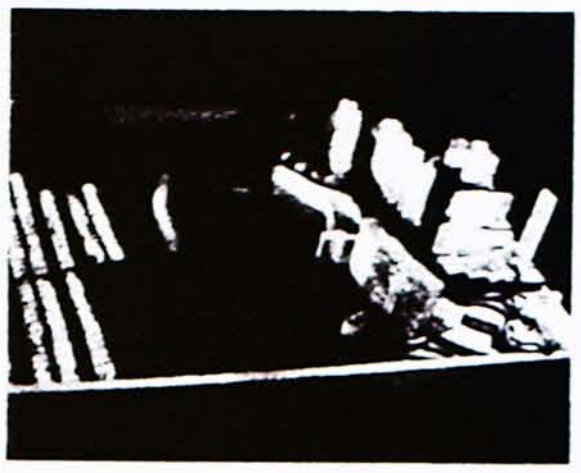
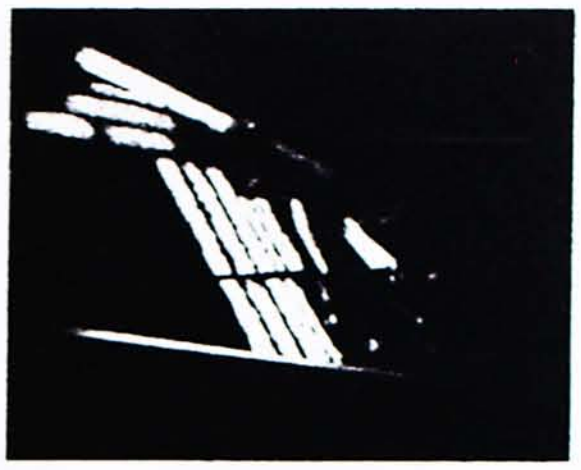
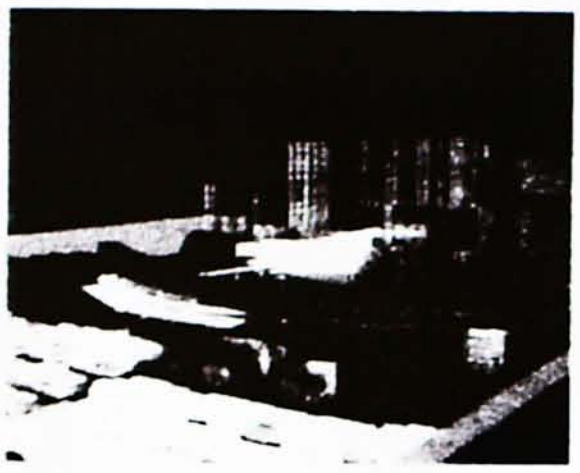
30mm aluminium panel

Head cap

Lock nut

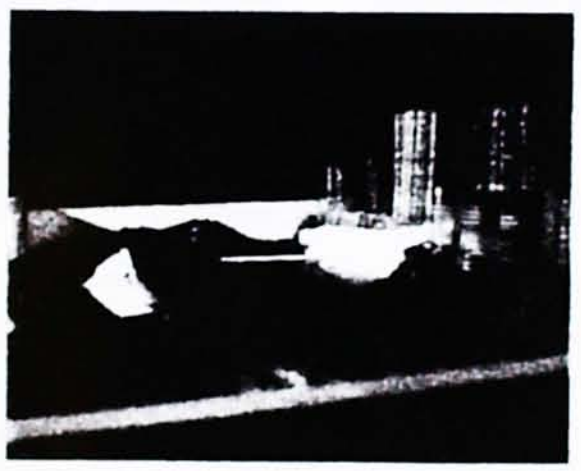
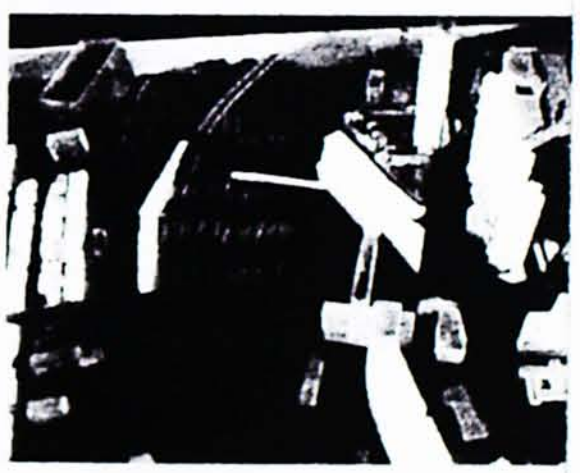
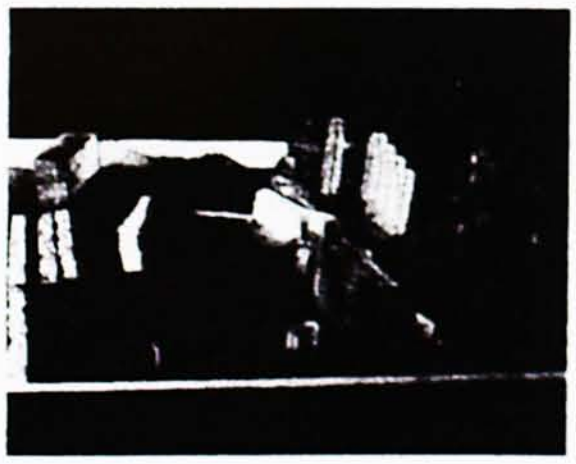
Zinc plated uniped pedestal

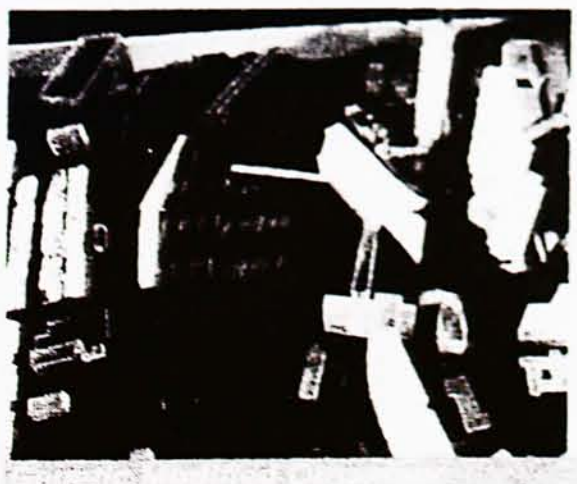
Pipe duct

Site Model

1:1000

Design Model

1:200

Great Thank to:
My **God**, for giving me all I need
My dear Mother, brother and sister, for their love and care throughout my life
Professor Wallace Chang, for guiding my way to the final design stage
Carmen, Ah Hau, Johnson, for being my brother and sister who always support me in all dimensions
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Appendix:

Site Visit – Customhouse of Customs and Excise Department in Mei Ching Road, Kwai Chung Cargo Terminal (25th October, 2002)

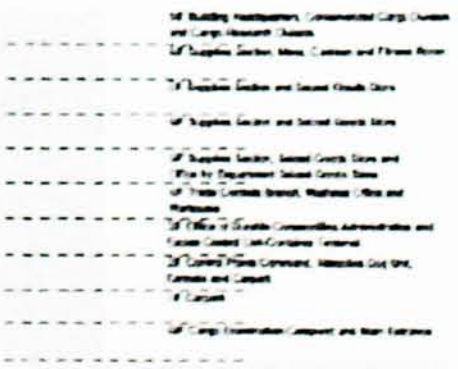
The construction of the building was finished by August of 2001. It is a new office branch of Customs Department in Kwai Chung Cargo Terminal to deal with ship search and cargo command. The complex includes one 9-storeys building block and a dangerous goods storage block. The different functional divisions are as follows:

Approximately 170 officials who work in the building and 8 drug detector dogs live in the 2/F kennels. They are mainly responsible for ship and cargo search so to suppress smuggling of contraband. Officers would be sent to different cargo terminals and search the suspected containers. The location undertaken the cargo inspection is decided by owner instead by the Custom Department. In usual case, cargo would not move to and check in the department building.

Cargo Terminal 9 will start its operation by 2003; the Customs Department will open a new office in the co-responded area instead of adding manpower in the Kwai Chung Customhouse.

Indeed, much space of the Customhouse is used as storage for seized goods. 5th floor to 7th floor are belonged to Supplies Section with seized goods store. Workers are employed to move the seized goods to the right floor. Such kind of arrangement is not that effective as the storage is separated by floor. It can be improved by a vertical opening between the 3 floors together with the provision of platform lift.

After the site visit, the option of designing a Customhouse extension is turned down because the department wouldn't need a further building extension while a separated office will be opened in Cargo Terminal 9. In addition, the suspected cargo wouldn't move to the building area, the possibility to combine different functional architectural units is rare.



The building programs of the Customhouse in the Container Terminal

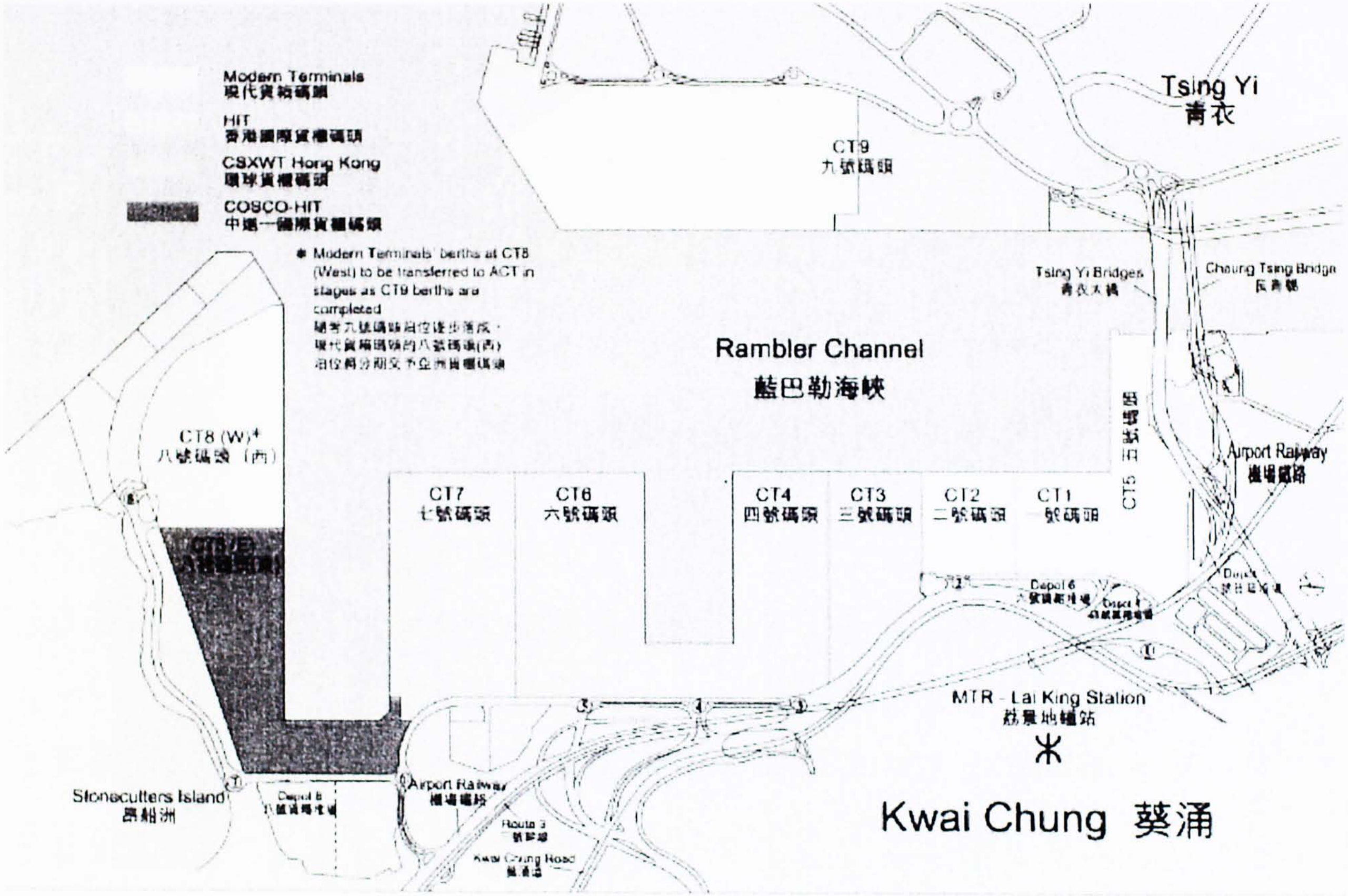
Site Visit – Modern Terminals Limited, Berth One, Kwai Chung Cargo Terminal 1 (5th November, 2002)

Modern Terminals Limited is established in 1969and started its operation by 1972. It is the first Cargo Terminal Limited in HK.

Nowadays, Modern Terminals Limited is one of the 4 main cargo terminal companies in HK. It owns Cargo Terminal 1, 2 and 5, while after the opening of Cargo Terminal 9, 4 new berths will be added. It maintains 24-hours operation and has totally 1,200 employees. They are on shifted duty and there are 3 shifts per day to keep the all day operation.

As explained by Miss Karen Chan, Assistant Corporate Affairs Officer, the cargo terminal business is mainly deal with the Shipping companies. It wouldn't get direct contact with the logistic company, the cargo dealers or the track drivers. The cargo terminal limited is responsible for the effective clearance of cargo from/in the ship. The cargos would be systematically organized when they are stored in the terminal or within the ship, so in case the cargos needed to be loaded up or down, the required time is the shortest. While the company also provide storage for cargo such as the dangerous goods shed and warehouse. In case of empty container, they are stored in the nearby depots. The Reefers are stored in the same location which is connected to power points.

For instance, the company would have a new office building in the Cargo Terminal 9. By that time, a new Control Tower will start its operation and responsible the cargo arrangement in Terminal 9.



Layout of the Kwai Chung Container Terminal

Hong Kong Container throughout by Sea

Hong Kong Container Throughput ('000 TEUs) 2002
2002年香港貨櫃碼頭吞吐量(千個廿呎貨櫃)

		Kwai Chung Terminal 葵涌貨櫃碼頭	Growth Rate(%) 升幅(%)	In the Stream 中流作業	Growth Rate(%) 升幅(%)	River Trade 內河貿易	Growth Rate 升幅(%)	Total 總計	Growth Rate(%) 升幅(%)
Jan 一月	Loaded 出口	459	-7.65%	112	3.70%	149	9.56%	720	-2.83%
	Discharged 入口	415	1.47%	156	9.09%	134	-2.90%	705	2.17%
	Total總計	874	-3.53%	268	6.77%	283	3.28%	1425	-0.42%
Feb 二月	Loaded 出口	367	0.00%	83	-2.35%	105	-4.55%	555	-1.25%
	Discharged 入口	356	-10.10%	105	-11.76%	132	33.33%	593	-3.42%
	Total總計	723	-5.24%	188	-7.84%	237	13.40%	1148	-2.38%
March 三月	Loaded 出口	483	-6.40%	115	0.00%	156	-1.27%	754	-4.44%
	Discharged 入口	445	-1.98%	143	-10.63%	154	-0.65%	742	-3.51%
	Total總計	928	-4.33%	258	-6.18%	310	-0.96%	1496	-3.98%
April 四月	Loaded 出口	518	7.02%	118	-0.84%	183	6.40%	819	5.68%
	Discharged 入口	457	1.33%	156	6.12%	171	1.79%	784	2.35%
	Total總計	975	4.28%	274	3.01%	354	4.12%	1603	4.02%
May 五月	Loaded 出口	486	4.74%	119	1.71%	169	11.92%	774	5.74%
	Discharged 入口	452	5.36%	145	5.84%	167	23.70%	764	8.99%
	Total總計	938	5.04%	264	3.94%	336	17.48%	1538	7.33%
June 六月	Loaded 出口	532	9.47%	132	14.78%	150	1.35%	814	8.68%
	Discharged 入口	471	9.28%	157	17.16%	170	6.25%	798	10.07%
	Total總計	1003	9.38%	289	16.06%	320	3.90%	1612	9.36%
July 七月	Loaded 出口	559	5.27%	156	36.84%	169	7.64%	884	10.22%
	Discharged 入口	493	9.31%	157	12.14%	177	-3.80%	827	6.71%
	Total總計	1052	7.13%	313	23.23%	346	1.47%	1711	8.50%
August 八月	Loaded 出口	567	1.61%	139	16.81%	163	16.43%	869	6.36%
	Discharged 入口	516	7.95%	161	16.67%	170	1.19%	847	8.04%
	Total總計	1083	4.54%	300	16.73%	333	8.12%	1716	7.18%

Grand Total(總計): Jan - Aug, 2002 二零零二年一至八月

	Kwai Chung Terminal	Growth Rate	In the Stream 中流作業	Growth Rate 升幅(%)	River Trade 內河貿易	Growth Rate 升幅(%)	Total 總計	Growth Rate 升幅(%)
Loaded 出口	3971	1.74%	974	9.19%	1244	6.14%	6189	3.72%
Discharged 入口	3605	3.03%	1180	5.55%	1275	5.63%	6060	4.05%
Total總計	7576	2.35%	2154	7.16%	2519	5.88%	12249	3.88%

Source : Marine Department 資料來源:海事處

Hong Kong External Trade by Sea by Major Commodities

Jan - Sep, 2002 二零零二年一至九月	HK$ million 百萬港元	% growth over last year 與上年同期比較的升幅(%)
Domestic Exports 本地出口		
1. Articles of Apparel & Clothing Accessories 服裝及衣服配件	27,659	-16.86%
2. Textile Yarn, Fabrics & Related Products 紡織紗, 織物及有關產品	2,782	-13.07%
3. Printed Matter 印刷品	1,788	-5.48%
4. Musical Instruments & Parts & Accessories 樂器及其零件及附件	859	21.35%
5. Edible Products & Preparations 食品及配製食品	732	4.96%
6. Tobacco, Manufactured 製成的煙草	619	2.64%
7. Plastic Articles 塑膠製成品	386	-24.14%
8. Polymers of Styrene, In Primary Forms 初級形狀的苯乙烯聚合物	363	2.34%
9. Aluminum 鋁	315	26.26%
10. Medicament (Including Veterinary Medicaments)(藥劑包括醫治動物用的藥劑)	239	-21.55%
Other Articles 其他	4,743	-29.86%
Total Merchandise 總計	40,485	-16.61%
Imports 入口		
1. Textile Yarn, Fabrics & Related Products 紡織紗, 織物及有關產品	35,804	-12.22%
2. Petroleum Oils 石油	14,890	-7.68%
3. Telecommunications Equipment 電訊設備	9,289	-25.46%
4. Polymers of Styrene, In Primary Forms 初級形狀的苯乙烯聚合物	9,276	4.57%
5. Motor Cars 汽車	9,158	-7.21%
6. Paper & Paperboard 紙及紙板	8,348	-4.80%
7. Leather 皮革	7,757	-14.36%
8. Parts & Accessories 機器的零件及附件	7,712	10.52%
9. Electrical Machinery & Apparatus 電動機械及器具	7,377	-3.83%
10. Other Plastics, In Primary Forms 其他初級形狀的塑膠	6,849	13.60%
Other Articles 其他	226,650	-5.86%
Total Merchandise 總計	343,110	-6.61%
Re-Exports 轉口		
1. Articles of Apparel & Clothing Accessories 服裝及衣服配件	58,385	-5.93%
2. Baby Carriages, Toys & Sporting Goods 嬰兒車, 玩具及運動貨品	56,440	-6.70%
3. Footwear 鞋履	30,948	-6.26%
4. Telecommunications Equipment 電訊設備	28,772	2.12%
5. Textile Yarn, Fabrics & Related Products 紡織紗, 織物及有關產品	20,741	2.44%
6. Travel Goods, Handbags 旅行用品, 手袋	20,414	-10.53%
7. Plastic Articles 塑膠製成品	15,796	-11.31%
8. Radio-Broadcast Receivers 無線電廣播接收機	14,731	5.45%
9. Household Type, Electrical & Non-electrical Equipment 家用型, 電動設備	13,094	-11.19%
10. Automatic Data Processing Machines 自動資料處理機	10,986	11.18%
Other Articles 其他	184,117	-2.89%
Total Merchandise 總計	454,424	-3.89%

Source: Census & Statistics Department, Hong Kong 資料來源:政府統計處

Number of Registered Vehicles in Hong Kong

領有牌照車輛：數目和增長[1]

車輛類別	1997	1998	1999	2000	2001
貨車					
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
小計	118 279 (1.3%)	115 051 (-2.7%)	113 770 (-1.1%)	114 277 (0.4%)	112 585 (-1.5%)
私家車	314 833 (7.3%)	318 137 (1.0%)	321 617 (1.1%)	332 379 (3.3%)	340 568 (2.5%)
電單車	23 511 (3.8%)	23 343 (-0.7%)	24 258 (3.9%)	25 500 (5.1%)	27 116 (6.3%)
的士					
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
小計	17 918 (0.7%)	18 053 (0.8%)	18 008 (-0.2%)	17 983 (-0.1%)	18 045 (0.3%)

Usage of Public Transport per day in HK

按公共交通機構劃分的平均每日載客人次

交通機構		平均每日載客人次 (以千人計)
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
鐵路	小計[1]	3 464 (31.5%)
由訂製車		10 (0.1%)
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
專利巴士	小計	4 241 (38.5%)
九鐵公司接駁及輕便鐵路服務範圍巴士		55 (0.5%)
[illegible]		[illegible]
[illegible]		[illegible]
小巴	小計	1 632 (14.8%)
的士		1 307 (11.9%)
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
渡輪	小計	152 (1.4%)
居民巴士		153[1] (1.4%)
各種交通工具	總計	11 013[1] (100%)

Size of Container (standard of Maersk Shipping LTD)

Dry containers

Maersk Sealand's dry containers come in several sizes and designs:

20' with a payload up to 28.3 metric tons

40' - both 8'6" and 9'6" high cube - with a payload up to 30.4 metric tons

45' - 9'6" high cube - with a total capacity of 86 cubic metres

Display the table in ft/lbs

Dry / Steel		Door openings (mm)		Internal dimensions (mm)			Weight (kg)			Volume (m³)
Type	Size	Width	Height	Length	Width	Height to load line	Max. Gross	Tare	Max. Payload	
20" std	20' x 8' x 8' 6"	2,340	2,274	5,896	2,350	2,385	27,000	2,150	24,850	33
40" std	40' x 8' x 8' 6"	2,339	2,274	12,035	2,350	2,393	32,500	3,700	28,800	67
40" high	40' x 8' x 9' 6"	2,340	2,577	12,035	2,350	2,697	34,000	3,800	30,200	76
45" high	45' x 8' x 9' 6"	2,340	2,585	13,556	2,352	2,697	32,500	4,800	27,820	86

Dry / Aluminium		Door openings (mm)		Internal dimensions (mm)			Weight (kg)			Volume (m³)
Type	Size	Width	Height	Length	Width	Height to load line	Max. Gross	Tare	Max. Payload	
40" wide door	40' x 8' x 8' 6"	2,343	2,278	12,056	2,347	2,379	32,500	2,790	29,710	67
40" high	40' x 8' x 9' 6"	2,343	2,584	12,056	2,347	2,684	32,500	2,900	29,600	76
45" high	45' x 8' x 9' 6"	2,340	2,584	13,582	2,347	2,696	32,500	3,900	28,600	86

Please note there may be slight size variations for some containers, as well as limitations regarding acceptance in certain locations.

Special features

Hanger beams which allow the transport of garments on hangers without further packing

An extra high payload and extra door-width versions

Bull rings and lashing bars to give your cargo added security

Ventilated containers for crops, such as coffee and cocoa

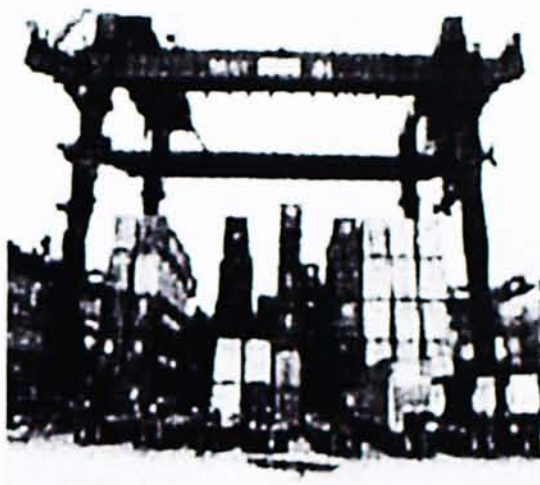
Types of Cranes in the Kwai Chung Container Terminal

Quay Crane

Quay crane is responsible for lifting containers from the ship to the land.

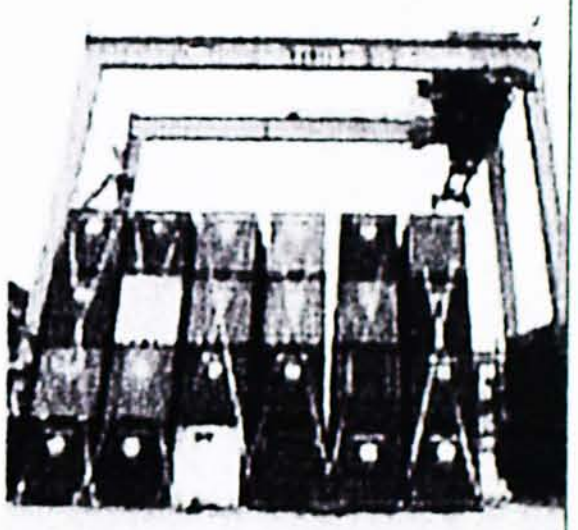
Rail Mounted Gantry Crane

It is in larger scale than rubber typed gantry crane and able to handle larger amount of containers on land.



Rubber Typed Gantry Crane

It is smaller than rail mounted gantry crane but more flexible in handling smaller amount of containers.



Spreader

Spreader is very effective in transporting container from different location.

Bridge Crane

Bridge crane is very light in scale and used for lifting container in the indooe environment.

More Site Photos